THE UNIVERSITY
of EDINBURGH

Risk Attitudes and Safety Culture in the English Fire and Rescue Services

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PhD by Research

The University of Edinburgh

2017

I declare that this thesis has been composed solely by myself and that it has not been submitted, in whole or in part, in any previous application for a degree. Except where stated otherwise by reference or acknowledgement, the work presented is entirely my own.

Signed: G. Wood

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Acknowledgements

I would like to take the opportunity to thank all firefighters for the work they do in protecting their communities and in recognition of the risks and the serious consequences they are exposed to.

I would like to thank the Chief Fire Officers, the appointed liaison officers, and their staff both non-uniformed and uniformed that assisted me in my research by either taking part or in helping to facilitate it. I would also like to thank my key informants for their assistance, advice and support.

I would also like to thank and express my deepest gratitude for the guidance, assistance, and the timely prompts from my supervisor, Prof Jake Ansell. I include my thanks to the administrative staff for keeping me on course and in touch with the University.

Finally, I would like to thank my wife Gail for her patience and support whilst I have been either absent from the home and the family environment whilst conducting this research, or locked away in my room writing this thesis.

I would also like to mention my friends and colleagues that have prompted me to want to better understand my previous work environment and helped focus my concentration and efforts on firefighter safety. In particular I would like to remember three colleagues who are no longer with us having died whilst attending operational incidents.

Station Officer Colin Townsley GM, died 18 November 1987: a role model to all who had the opportunity to serve with him.

Sub Officer Kevin Power, age 35, died 30 September 1992: a typical Watch officer that provides the backbone to, and the strength of the fire and rescue service.

Firefighter Michael Hill, age 33, died 1993: who had the potential to advance through the ranks to become a good Watch officer.

List of abbreviations

AC	Audit Commission
ACPO	Association of Chief Police Officers
ALARP	As low as reasonably practicable
ALP	Aerial Ladder Platform
AM	Area Manager
ARA	Analytical Risk Assessment
BA	Breathing Apparatus
BAECO	Breathing Apparatus Entry Control Officer
BM	Brigade Manager
CAA	Comprehensive Area Assessment
CFO	Chief Fire Officer
CFOA	Chief Fire Officers Association
CFRA	Chief Fire and Rescue Adviser
CFRAU	Chief Fire and Rescue Advisory Unit
CFS	Community Fire Safety
CLG	Communities and Local Government (a central government department)
CM	Crew Manager
CPA	Comprehensive Performance Assessment
CSO	Command Support Officer
CU	Control Unit
DCFO	Deputy Chief Fire Officer
DCP	Decision Control Process
DMM	Decision Making Model
DRA	Dynamic Risk Assessment
FBU	Fire Brigades Union
FPA	Fire Protection Association
FRA	Fire and Rescue Authority
FRAT	Fire and Rescue Advisory Team
FRD	Fire and Resilience Directorate
FRS	Fire and Rescue Service
FRSIP	Fire and Rescue Service Improvement Programme
FSC	Fire Service College
GCSE	General Certificate in Secondary Education
GM	George Medal
GM	Group Manager
GMFS	Greater Manchester Fire Service
GRA	Generic Risk Assessment
HFRC	Home Fire Risk Check
HMFSI	Her Majesty's Fire Service Inspectorate
HMIC	Her Majesty's Inspectorate of Constabulary
HP	Hydraulic Platform
HQ	Headquarters
HSE	Health and Safety Executive
HSL	Health and Safety Laboratories
HVP	High Volume Pump
ICM	Incident Command Model
ICS	Incident Command System
IFE	Institution of Fire Engineers
IIA	Institute of Internal Auditors
IMDP	Integrated Management and Development Programme. Used in the LFB and the forerunner of IPDS.
IPDS	Integrated Personal Development System
IRA	Individual Risk Assessment
IRM	Institute of Risk Management
IRMP	Integrated Risk Management Plan
JDM	Joint Decision Model
JESIP	Joint Emergency Services Interoperability Programme
KLOE	Key Lines of Enquiry
LFB	London Fire Brigade
LFEPA	London Fire and Emergency Planning Authority
LGA	Local Government Association
LU	London Underground
MO	Monitoring Officer
NDM	Naturalistic Decision Making
NOS	National Occupational Standards
NPCC	National Police Chiefs Council, which repaces the ACPO
NVQ	National Vocational Qualification
OC	On-Call contract, previously referred to as Retained Firefighters
ODPM	Office of the Deputy Prime Minister
OpA	Operational Assessment and Fire Peer Challemge programme
OPTI	Operations, Performance and Training Inspectorate of the LFB
OTPI	Operations, Training and Performance Inspectorate. This was the first name given to this team when it was established in the LFB.
PAF	Principal-axis Factoring Analysis
PCA	Principal Components Analysis
PCC	Police and Crime Commissioner
PO	Principal Officer
PPE	Personal Protective Equipment
RPD	Recognition-Primed Decision Making
RRO	Regulatory Reform Order
RSG	Revenue Support Grant
RSPCA	Royal Society for the Prevention of Cruelty to Animals
RTA	Road Traffic Accident
RTC	Road Traffic Collision: replaces use of RTA
SM	Station Manager
SO	Senior Officer
SOP	Standard Operating Procedures
SRA	Strategic Risk Assessment
StnO	Station Officer (rank)
SubO	Sub Officer (rank)
TL	Turntable Ladder
WB	Watch Based Staff
WCC	Warwickshire County Council
WM	Watch Manager
WT	Wholetime staff on full-time contracts

Abstract

In the ten year period between 2004 and 2013 the UK lost 13 operational, and one non-operational, firefighters at fires, a relatively large number in relation to previous losses. These fatalities occurred during a period in which fire fatalities of members of the public were at an all-time low but fire and rescue services (FRS) and their staff were being accused in the media of becoming risk averse. This research was focussed on investigating the risk attitudes and safety culture in the English fire and rescue services.

The research question asked how the safety culture manifests itself in the English fire and rescue service and what are its implications? A mixed approach to the research was adopted utilising both quantitative and qualitative methods. The research strategy was inductive using a multiple case study. A safety culture questionnaire was designed and then piloted in one FRS with the responses being subjected to a factor analysis the results of which indicated there were four dimensions: management, procedures, competence, and work pressures. The final version of the questionnaire was then distributed across five FRSs from which 845 were returned, of which 823 were used in a series of statistical analyses. Two independent variables were used in the analysis; the first consisted of the individual FRSs, the second consisted of three groups based on Schein's three generic subcultures of executive, designer and operator. These were aligned with principal officers (PO), senior officers (SO), and Watch based (WB) staff respectively. The analysis of the completed questionnaires indicated that the WB group had a negative attitude towards their FRS safety culture, while the SO and PO groups had a more positive attitude with the PO the most positive. All three groups were significantly different to each other. In conducting the qualitative part of the mixed methods the researcher rode with three Watches at a station in each of three FRSs to observe the behaviour of WB staff and attending SOs at incidents and during their daily activities. During the course of the fieldwork nineteen members across all of the participating FRSs were interviewed, and twenty-four focus groups were conducted. What was clear was that the competence based training system was not popular with WB staff who believed it to be too bureaucratic, whilst SOs and POs believed that it had not fulfilled their expectations of what it would deliver. There were also concerns expressed that the promotion system, associated with the competence-based training, was producing managers and not the leaders required on the incident ground.

It was concluded that safety culture within the FRS is associated with the systems, policies and procedures reflective of FRS management's level of risk tolerance producing a rule-based decision-making bureaucracy; this level of risk tolerance then influences how operational firefighters operate on the incident ground. In the world of the operational firefighter a typical incident, which by its very nature is a temporary event, is laden with uncertainty, complexity and in which all the potential risks may not yet have been identified with decision-making being focussed on problem-solving. FRS personnel find themselves operating in a risk climate in which they build temporary command structures, construct temporary processes and controls reflecting the incident commander's risk appetite for the purpose of moving towards operating in a safety climate in which to resolve the incident. The combination of the FRS's safety culture and the operational firefighter's risk climate determine what the researcher has defined as the FRS operational culture.

Lay summary

In the ten year period between 2004 and 2013 thirteen operational, and one non-operational, firefighters died whilst attending fires in the UK, a relatively large number in relation to previous losses. These fatalities occurred during a period in which fire fatalities of members of the public were at an all-time low but fire and rescue services (FRS) and their staff were being accused in the media of becoming risk averse. This research was focussed on investigating the risk attitudes and safety culture in the English fire and rescue services. The research question asked how the safety culture manifests itself in the English fire and rescue service and what are its implications? The research approach included both quantitative and qualitative methods. A safety culture questionnaire was designed and then piloted in one FRS, the results of which indicated there were four dimensions: management, procedures, competence, and work pressures. The final version of the questionnaire was then distributed across five FRSs of which 823 were used in a series of statistical analyses. The researcher observed the behaviour of FRS staff from three stations in three separate FRSs at incidents and during their daily activities. What was clear was that the competence based training system was not popular with station-based staff who believed it to be too bureaucratic, whilst senior officers believed that it had not fulfilled their expectations of what it would deliver. There were also concerns expressed that the promotion system, associated with the competence-based training, was producing managers and not the leaders required on the incident ground.

It was concluded that the safety culture within the FRS is associated with the systems, policies and procedures reflective of FRS management's level of risk tolerance producing a rule-based decision-making bureaucracy; this level of risk tolerance then influences how operational firefighters operate on the incident ground. In the world of the operational firefighter a typical incident, which by its very nature is a temporary event, is laden with uncertainty, complexity and in which all the potential risks may not yet have been identified with decision-making being focussed on problem-solving. FRS personnel find themselves operating in a risk climate in which they build temporary command structures, construct temporary processes and controls reflecting the incident commander's risk appetite for the purpose of moving towards operating in a safety climate in which to resolve the incident. The combination of the FRS's safety culture and the operational firefighter's risk climate determine what the researcher has defined as the FRS operational culture.

Chapter 1 Introduction

1.1 Researcher's interest in conducting this research

The researcher's interest in this research stems from his own career in the Fire and Rescue Service (FRS) as an operational firefighter, fire officer, a training officer, and as an operational assurance officer. This career included four years seconded to one of Her Majesty's Fire Service Inspectorate's inspection teams and then as the risk manager to the FRS modernisation programme. During this career the researcher has served at some of the busiest stations in the London Fire Brigade and has attended some notable events such as the Clapham Rail junction crash which made the national news and others that were of only local interest. The majority of these incidents have been smaller incidents some of which have tested the researcher not only physically in extremes of heat and humidity, but mentally including overcoming natural instincts for self-preservation and then dealing with the aftermath of serious fires or non-fire incidents involving fatalities. This career has seen the researcher lose friends and colleagues in the performance of their operational duties and it was from this background that the researcher wanted to better understand what was happening, or had happened, to cause this increase in firefighter deaths and an apparent difference in attitude towards safety culture between the three groups of POs, SOs, and WB staff.

The media, the Fire Brigades Union, and firefighters themselves have expressed their concerns regarding the increase in firefighter deaths in the previous decade. This was at a time when fire deaths to members of the public were continuously being reduced over a period of the last thirty years. The number of fire calls had been reduced and of those fires the FRS was attending they tended to be smaller fires requiring less FRS resources to deal with them; and the extent of the resulting fire damage was being reduced by building regulations and fire prevention with new innovative solutions called fire-engineered solutions being introduced. The public were becoming more aware of the hazards in their homes, the risk of fire, and the possible consequences. So what went wrong? Why were there suddenly so many firefighter fatalities?

There were two main events that occurred at the same time that may have led to the FRS coming to the attention of the media in regard to the firefighter fatalities and claims of becoming risk averse. The first is that the time period of these deaths coincides with the time that a mass of firefighting experience gained at a time when the numbers of fire calls were high, and the size and extent of these fires were often very large, was being lost as a generation of experienced firefighters retired. These firefighters had been taught and had learned the lessons of practical firefighting by older generations of very experienced firefighters. Their theoretical knowledge included building construction, hydraulics, and theoretical firefighting built on learning, and tested by examinations. Many firefighters had trade qualifications that provided them with detailed knowledge of building construction, gas and electrical installations, and vehicle mechanics. Others had served in the military and their leadership, and command and control skills, were easily transferred from the military to the FRS. Skills had been acquired during training, and experience gained in their application on busy and varied incident grounds.

The second main event was the modernisation of the FRS in England which completely changed the whole philosophy of firefighting in England. What had been a reactive rescue and firefighting service was to become a proactive fire prevention service whose primary focus was on preventing fires. Modernisation included an increased emphasis on ensuring FRS staff reflected the demographics of the communities they served as part of the agenda on equalities and diversity. No longer was being a qualified electrician or ex-serviceman seen as an asset during the selection process. Recruitment and selection to enter and progress in the FRS was changed to incorporate the use of assessment centres and training was now focussed on competence based training for the individual. It is these two key events, the loss of experience and the results of modernisation that many observers, including a number of FRS staff, consider has contributed to the increase in firefighter deaths over that period of change.

The importance of this research is that it highlights the key issues as identified by operational firefighters and officers themselves as to what their concerns are in regard to the safety culture of the FRS in England; how it is being exercised in their own FRS; and what the effect is on them and their colleagues. How do they reconcile those issues arising between their safety with their perceived role of saving life and property in a dynamic and risk-laden environment?

1.2 The research questions and research design

The principal question for this research asked: How does safety culture manifest itself in the English FRS and what are its implications?

Four sub-questions asked:

- What are the artefacts of the safety culture in the FRS?
- What are the beliefs and values of operational staff in regard to the FRS safety culture?
- What are the underlying assumptions affecting the safety culture of firefighters in the selected FRSs?
- What are the influences affecting the perceptions of key stakeholders of operational risk to FRS operational personnel?

This research took the form of a cultural study so a mixed approach was adopted to enable the researcher to utilise both quantitative and qualitative approaches. The research strategy was inductive chosen for its suitability in conducting cultural research using observations, focus groups, interviews etc. to make generalisations. The ontology was based on that of the realist, which is complementary to the use of a mixed methods approach in gaining a deeper understanding of the phenomena. The epistemology was neo-realism in that the researcher wanted to focus on the structures and processes, both formal and informal, to be found in the participating FRSs. The researcher adopted interpretivism as the research paradigm in which social reality is viewed as a product of the participants based on their interpretations of their environment. The strategy of enquiry was that of a case study. The researcher was aware that with his knowledge and experience of the FRS a deductive research strategy could have been chosen but that may have caused concern regarding the researcher having introduced his bias and compromised his independence in conducting this research by the selection of theories and hypotheses to be tested.

In conducting this research the most significant finding has been determining what safety culture means to FRS operational staff and its constituent dimensions. Factorial analysis of a pilot questionnaire identified there were four dimensions contributing to the concept of

safety culture which were labelled: management, procedures, competence, and work pressure. The analysis of the responses to the questionnaire identified that WB staff tended to have stronger attitudes towards acceptance of risk and negativity towards the effects of modernisation than the other two groups consisting of SOs and POs with many of the differences between groups proving to be statistically significant.

The research identified that there were concerns amongst FRS operational staff regarding the competence of individuals but the greatest concern was the lack of experience, with SOs having been particularly identified by WB staff. This concern related to the number of officers being promoted and taking charge at incidents that did not have the experience the WB staff thought was necessary for the role. Issues of a lack of trust and confidence were identified but this may be the result of the lack of team working between officers and WB staff due to their different shift systems, resulting in the use of ad-hoc or pseudo-teams being established for each incident. WB staff also voiced their concerns regarding the lack of realistic fire training that was being provided by their FRSs. Both officers and WB staff were critical of the national competence based training believing it to be too bureaucratic and that it had not fulfilled the expectations that had accompanied it following the FRS modernisation programme.

The final significant element in the findings, and which will contribute to the body of academic knowledge, was identifying the links between Soeter's (2000) use of the concept of an organisation, particularly uniformed organisations, having a hot and a cold side; the use of the concepts of safety and risk; and culture and climate.

Soeter uses the term hot side of organisation to reflect the typical headquarter functions that determines the policies and procedures used to protect the organisation, its employees, and its resources. The second side is what Soeter calls the hot side and refers to the working environment that tends to be dynamic, in which there are time constraints, and employees, and often material resources, are exposed to high levels of risk. This was then linked to concepts of culture and climate, the former being a more stable concept and longer lasting, whereas climate is temporal by its nature and situationally dependent. These were then linked to the concepts of risk and safety. From these links we can look at the cold face of an organisation as operating within the organisation's safety culture, where policies and safe working practices ensure the safety of employees, other people and equipment,

and that the risk exposure is within the risk tolerance of the organisation. On the hot side of the organisation, for example in the FRS, when they are called to an incident the crews and officers attending form a temporary grouping that only exists for as long as it takes to resolve the incident. They operate in a risk climate with its own risk appetite set by the incident commander, and aligned to the FRS's safety culture, which focuses on identifying the risks and actively managing them. Having identified the risks and established the appropriate risk controls the FRS personnel at the incident can be said to be then working in a safety climate. As new risks or uncertainties are identified, or processes are changed then they will revert to operating in a risk climate once again until they can be mitigated to an acceptable level. Safe working practices can be used for guidance where applicable, but robust decision making is the key in these circumstances.

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Chapter 2 Literature Review

This chapter highlights the range of previous research conducted into major accidents in different industries, then moves on to look at organisational culture and the hierarchical cultures that lay beneath it. The issue of what is culture and climate is then discussed before moving onto the subject of safety culture and how it has been previously defined. The chapter then looks at the three terms of hazard, risk, and uncertainty and how they have been used and defined. The concept of an organisation having two sides to it, a 'hot' and a 'cold' side, and the effect it has on the culture of an organisation is then developed. The three generic subcultures of executive, designer, and operator identified by Schein are highlighted and how they relate to an organisation and its culture. The review then moves on to address the question as to whether a culture is something an organisation 'has' or 'is', and the theoretical perspectives of the three cultural dimensions is then discussed. The literature on how culture has previously been viewed, particularly with regard to layers of culture is then introduced before moving onto to look at accidents from the perspective of High Reliability Organisations theory. The human factors involved in the causes of accidents is the introduced and focusses on leadership, commanders and managers, decision making, and trust. Finally, this literature review looks at the relationship between risk and safety cultures.

2.1 Accident research

Research into the high-tech hazardous technologies such as in nuclear power plants (Sagan, 1993; Reason, 1997), aircraft accidents (von Thaden et al., 2004; Dekker, 2005a; b; Gibbons et al., 2005; Dekker, 2006; 2007; Wiegmann et al., 2007; Dekker, 2011a; b), the oil industry (Flin, 1996; Hopkins, 2008), the fire and rescue service (Flin, 1996; Klein, 1998; Flin and Arbuthnot, 2002; Tissington and Flin, 2005; Flin et al., 2008; Pessemier and England, 2010; Catherwood et al., 2011) and medical/surgical teams (Bognár et al., 2008; The Health Foundation, 2011) has assisted us in building a greater understanding of the causes of accidents in each of their fields. This body of previous research has focused on the psychological issues around decision-making and situational awareness in dynamic, high-pressure and complex situations (Gigerenzer and Goldstein, 1993; Cannon-Bowers and Salas, 1998; Collyer and Malecki, 1998; Gigerenzer et al., 1999; Snook, 2000; Rake and Njå,

2009; Gigerenzer et al., 2011; Gigerenzer, 2014). Research has also been previously conducted into safety culture and its role in the cause of accidents (e.g. Antonsen, 2009c; Antonsen, 2009b; Antonsen, 2009a; Dekker, 2011b; Levenson, 2011). In the USA there has been some research conducted into safety culture and the US fire service (Pessemier, 2010; Pessemier and England, 2010) and a number of US National Fire Academy students attending the Executive Fire Officer Program have produced dissertations focussed on safety culture (e.g. Charter, 2009; Wooten, 2009; Jordan, 2013; Williams, n.d.). The researcher, on enquiring after these dissertations, was informed by a member of staff at the US National Fire Academy that the term 'dissertation' is used for what are in reality course assignments.

A review of the accident literature identifies four key areas in regard to the risk of accidents occurring in organisations some of which may be overlapping in different texts. These are:

- Culture
- Human factors
- High Reliability Organisations
- Systems and control failures

Each of these four areas are linked in that organisational systems consisting of structures, safe-working processes and their associated systems' controls are operated by humans who influence and are influenced by the organisational culture and its subcultures. This literature review is focussed on culture and specifically safety culture but will need to address the three remaining areas so as to present safety culture in the appropriate context.

2.2 Organisational culture

Organisational culture has been the subject of studies since the 1940s (Alvesson, 2013) but it was from the 1980's that corporate, or organisational culture became a focus of research attention as the limitations of organisational research, based on the structure of an organisation has become evident (Cooper, 2000). The work conducted in organisational culture has appealed to organisational managers for its potential in contributing to greater

production and efficiency gained through an increased commitment of the workforce in line with corporate goals, objectives, functions, and procedures.

Conducting cultural research requires a focus on the meanings attached to symbols which influence, or guide, how individuals and groups think, feel, and act. It is the meanings associated with a specific phenomenon that are the subject of cultural analysis and addresses the experiences of organisational members as they perceive them (Alvesson, 2013).

Schein (2010, p3) informs us that culture is constantly evolving and dynamic in its nature being "constantly re-enacted and created by our interactions with others and shaped by our own behaviour".

2.2.1 Culture, sub-cultures, microcultures and macrocultures

Within classical organisation theory there are several related approaches that view organisations as being comprised of multiple and competing cultures (Bolon and Bolon, 1994). Previous research on organisations (e.g. March and Simon (1958) and Cyert and March (1963)) has viewed competing cultures as consisting of various groups each vying for organisational attention to present their own interests and achieve their own goals and objectives based on their different sets of understandings and assumptions, i.e. their own culture; the term 'internal politics' is often associated with this situation. These competing groups can be based upon vertical (hierarchical) or horizontal (departmental) boundaries or by any other grouping in which its members share the same values and interests (Pennings and Goodman, 1979; in Bolon and Bolon, 1994). Bolon and Bolon conclude that in conducting cultural research the identification of organisational groups should be based on the distinctions the members identify themselves. It is this self-identification that Gregory (1983) uses in her 'native-view' paradigm which studies participants from their own perspective.

In recognising that an organisation will consist of different subgroups Gregory uses the term 'multicultural' to describe an organisation and the term ethnocentrism to describe how a group will take for granted its own cultural views and use them to evaluate the behaviour of others which, she points out, is likely to lead to misunderstandings and

conflicts. Each of these groups can be seen as a subculture of the wider organisational culture.

Tushman (1977, p207), in regard to the unit of analysis being used in cultural research, makes the observation that “to understand organisational behaviour, the unit of analysis must be the basic subunits which make up an organisation. Following the systems framework, organisational behaviour can be seen as a result of interactions among subunits within the organisation". Schein (2010) acknowledges that there has been a growing interest in small groups such as surgical teams or task forces operating in a matrix style structure and that these groups cut across recognised occupational groups and their associated sub cultures. Schein terms the culture of these small groups as each being a ‘microculture’. Of the various levels of culture within an organisation, microcultures tend to be dynamic in nature and present greater levels of variation.

It is at the level of the organisation (organisational culture) and its small groups (microcultures) that the influence of leadership is most apparent as it is the leadership role that creates, embeds, and maintains that culture which then inevitably acts as a constraint therefore in stabilising, providing structure, and meaning to the group members (Schein, 2010). This extends to the point that the style of future leadership that will be acceptable to the group or within the organisation in the future will be determined by the culture. Schein (2010) describes culture and leadership as being two sides of the same coin particularly in times of turbulence, for example when an organisation is undergoing some form of change, and then the forming of a new culture, and how it subsequently evolves, will remain uncertain. Observations of subcultures within an organisation are likely to reflect those of the occupational culture, which (Schein, 2010) refers to as a macroculture. The assumptions associated with these subcultures will be found in most circumstances to reflect the functional tasks, occupations, or their experience base.

2.3 Culture versus climate

The concepts of climate and culture have in the past been used interchangeably (Katz and Kahn, 1978; in Schneider, 1990) and each has been defined in many different ways by various authors. Pettigrew (2000, p xiv) informs us that climate and culture are derived from different intellectual heritages based on a range of disciplines including psychology,

sociology, and social anthropology each with their own theoretical, epistemological, and methodological biases. Martin (2002) refers to Denison (1990) and Schneider (1990) as researchers who believe that that there are large areas of similarity between the two concepts but Martin (1992), and Glick (1985; in Guldenmund, 2000) believe the principal difference is based on the research methodologies used with each concept. Glick attributes this difference in use of research methodologies to organisational climate being based on a psychological framework whereas culture has its roots in anthropology with the former adopting a quantitative and the latter mainly a qualitative approach.

Pettigrew (2000) associates climate research as having been in use at an earlier stage than culture research but that the focus is now more on that of culture. He attributes this to issues associated with the levels of analysis, aggregation, and measurements within climate research. Similarly, Schneider (2000) attributes many researchers adopting a cultural perspective to be based on the problems of how to measure climate including issues such as aggregation. As culture began to be accepted as mainstream in the early 1980s there was a clear distinction between culture and climate (Denison, 1996). If one was studying culture then qualitative research methods, involving in-depth interviews, observations, document analysis, and a focus on individual social settings were the appropriate choice so as to gain a deeper understanding of the underlying assumptions from the perspective of the insider within the organisation. This contrasted with studying climate in which quantitative methods and research tools, such as the use of questionnaires, and the assumption that the results could be generalised across the range of social settings based on the perceptions of those members of the organisation being studied. The results can then be used to categorise the observed practices and perceptions into dimensions which could then be analysed. Schneider (2000) also makes this point in differentiating between culture and climate in that climate researchers use survey measurements and is based on the perceptions and experiences of individuals. However, he does acknowledge that surveys will sometimes be used in cultural research. Pettigrew (2000) believes that the major advantage culture has over climate is that it cannot be dismissed as being simply another variable. He acknowledges that because a wide range of disciplines have adopted a cultural perspective problems have arisen over the definition, underlying theory, and methodological approach that should be adopted. Pettigrew and Schneider (1990) inform us that there is a growing trend to use a combination of the two concepts in appreciating

wider related phenomena. This allows the strengths of both perspectives to be utilised. Schneider (2000) lists these strengths as:

Climate

- A strategic focus on identifiable organisational imperatives, including safety.
- The measurement and analysis of the degree to which perceptions are shared by organisational members.

Culture

- A specification of the psychological attributes that are less visible such as values, beliefs, and meanings.
- The development of culture over time through socialisation processes.

Schneider has previously argued (Schneider, 1985; Reichers and Schneider, 1990) that the links between the two concepts are such, both conceptually and in practical terms, that a combination of culture and climate might provide the basis for a new paradigm as suggested by Smircich (1985; in Schneider, 2000) and reflecting the 'dynamic relationship' that Jones and James (1979; in Guldenmund, 2000) believe to be present. Schneider believes that this potential overlap between climate and culture is predominantly the view of those researchers who favour the climate perspective. Glick (1985, p612, in Guldenmund, 2000) concluded that the minor differences between the two concepts "… may prove to be more apparent than real" whilst Reichers and Schneider (1990) see climate and culture not so much as over-lapping but as two distinct parallel lines of research. Guldenmund (2000, p220) has a different view to Schneider as he believes "the development of these concepts has been successive rather than in parallel". An alternative view on the differences between climate and culture is that proffered by Ott (1989, in Schneider, 2000) who believes climate is transient in nature, or as Denison (1996) points out, it provides a snapshot at a certain point in time. Schneider (2000), who sees himself as a climate researcher, believes that it was the failure of climate researchers to make use of data gathering by observation, and those elements associated with anthropology such as

the use of norms, taboos, myths and stories that allowed culture to take such a foothold over climate research.

Martin (1992) believes that with such wide-ranging views on what culture means there is the danger that it can be “used to represent almost anything and everything being only dependent on who is conducting the research.” This is similar to the point that Guldenmund (2000, p216) makes in that the two concepts “are so global and abstract, they can also run the risk of becoming virtually meaningless”. Alvesson (2013, p3) refers to the vague way in which people use the term culture and the importance when using the concept to ensure it is done so “without losing focus, direction and interpretive depth”.

Schneider (2000, p. xxi) asks his subjects to describe their experiences of things that happened to them or are present in the setting of their work environment in what he calls ‘climate’. In his more recent research he has started to ask employees as to why they think things happen as they do. This results in stories and myths being elicited that have led him “to think about organisational culture as the beliefs employees have about what management believes and values.” He goes on to say:

> "The focus groups I have conducted with employees reveal the reciprocal relationship between experiences and attributions: climate causes culture, but the reverse is also true. This fundamental reciprocity is where the rapprochement between climate and culture exists for me - two complimentary ideas that reveal overlapping yet distinguishable nuances in the psychological life of organisations".

Ekvall (1983; in Guldenmund, 2000) differentiates between climate and culture by categorising an organisation’s social system into four segments that are mutually related but distinguishable:

- Organisational culture: beliefs and values about people, work, the organisation and the community that are shared by most members within the organisation.
- Social Structure: especially the informal organisation.
- Organisational climate: characteristics of behaviour and expressions of feelings by organisational members.

- Work relations: particularly the nature of the relationship between management and employees.

Using the work of Denison (1990) to assist in differentiating between climate and culture, Martin (2002) informs us that climate research tends to focus on themes such as beliefs, values, or basic assumptions, informal practices, using relatively narrow and specialist studies based on the assumption that the results will be representative of an entire organisational climate or culture. It is this "integrationist assumption" that reflects the level of similarity between climate and culture but does not take into account those assumptions based on differentiation or fragmentation..

Schein (1992, referred to in Guldenmund, 2000, p230) believed that climate precedes culture, or that “climate is culture in the making”. Taking the point of a combination of the two concepts of climate and culture Guldenmund (2000, p221) informs us that generally the term climate has effectively been replaced by culture which, as it has developed, has incorporated the meanings of climate. This has left the use of the term ‘climate’ to refer to the “overt manifestation of culture within an organisation. Therefore, climate follows naturally from culture or, put another way, organisational culture expresses itself through organisational climate”.

Denison’s comparison between the two concepts shown in Table 2-1 summarises the main differences between the two concepts.

Table 2-1. Contrasting organisational culture and organisational climate research perspectives.

Differences	Culture literature	Climate literature
Epistemological	Contextualised and ideographic	Comparative and nomothetic
Point of view	Emic (native point of view)	Etic (researcher's viewpoint)
Methodology	Qualitative field observations	Quantitative survey data
The level of analysis	Underlying values and assumptions	Surface-level manifestations
Temporal orientation	Historical evolution	Ahistorical snapshot
Theoretical foundations	Social construction; critical theory	Lewinian field theory
Discipline	Sociology and anthropology	Psychology

Source: Denison (1996)

We can summarise the differences between climate and culture in how they had been operationalised and then assessed in the following way. Guldenmund (2000) informs us

that organisational climate has limited dimensionality and is assessed by the use of objective or semi-objective measures such as self-administered questionnaires. The results are then used to determine the organisational climate by aggregating the attitudes of the respondents. In regard to organisational culture he informs us that a phenomenological approach is the most common approach utilising observations, interviews, and comparisons with these measures being qualitative in nature.

We have seen the two concepts evolve from when they were previously considered two separate concepts with issues being raised by the different disciplines as how to measure climate. There has been the suggestion that by using both approaches then the weaknesses associated with both concepts can be mitigated (Schein, 2010). Guldenmund's (2000) approach in that climate can be used to measure the overt manifestations of culture supports how the one concept can complement the other and would make participating in research projects more attractive to organisations.

The researcher's perspective is that climate and culture have evolved to a stage where they should be considered complimentary to each other. Climate is a manifestation of culture and that the first changes to a culture will be observed by a change in the organisational climate. Climate research will appeal to management and consultants as it requires fewer resources and is quicker to complete that culture research. However, climate is more temporal than culture and less stable so it is more likely to change. Culture research is more resource intensive particularly in the time required to gain the understanding of the basic underlying assumptions; it is stable and less subject to change as found in climate research.

2.4 Safety Culture

There is a general acceptance of the relationship and the theoretical ties between safety culture and organisational culture (Nævestad, 2009; Edwards et al., 2013) that allows us to research the two concepts in similar ways. The use of the term 'safety culture', a subculture of an organisation's culture, is associated with the investigation into the Chernobyl nuclear reactor accident where the International Atomic Energy Agency identified a poor safety culture as a contributory factor to this nuclear accident (IAEA, 1986; as cited in Cox and Flin, 1998; and Edwards et al., 2013).

Guldenmund (2000; 2007), Zhang et al. (2002), Hopkins (2006) and Antonsen (2009c) inform us that only limited consensus has been reached in regard to defining safety culture, the causes, content and consequences of safety culture and safety climate in the previous 20 years with a lack of models to identify the relationship between the concepts of safety and risk management or safety performance. With this lack of consensus researchers have tended to re-define the term 'safety culture' to reflect their own particular sphere of interest and research (Guldenmund, 2000). This trend is in line with the view of Martin (2002) who believes that a definition of culture should be specific to the research being carried out. In their research Edwards et al. (2013) take the view that safety reflects the behaviours which either increase or decrease the risk of harm including the use of policies and procedures and whether they are being adhered to. They highlight that the nature of what is safe or unsafe behaviour will vary between industries, managers, supervisors and the workforce. Table 2-2 below shows how Zhang et al. (2002), in the absence of a consensus, differentiate between safety culture and safety climate.

Table 2-2. Differentiating between safety culture and safety climate.

Safety culture	Safety climate
A concept defined at group level or higher, which refers to the shared values among all the group of organisation members	Is a psychological phenomenon, which is usually defined as the perceptions of the state of safety at a particular time.
Is concerned with formal safety issues in an organisation, and closely related to, but not restricted to, the management and supervision of systems.	Is closely concerned with intangible issues such as situational and environmental factors.
Emphasises the contribution from everyone at every level of an organisation.	
Has an impact on the organisation's members' behaviour at work.	
Usually reflected in the contingency between reward system and safety performance.	
Reflected in an organisation's willingness to develop and learn from errors, incidents, and accidents.	
Is relatively enduring, stable and resistant to change.	Is a temporal phenomenon; a "snapshot" of safety culture, which is relatively unstable and subject to change.

Source: Zhang et al. (2002)

In the same way as organisational culture develops, the evolvement of a safety culture reflects the shared history of the group, how long that group has been together, the stability of the membership of that group with people leaving and joining, the emotional experiences, and the intensity of events they have shared in common (Schein, 2010).

2.4.1 Definitions of safety culture

Before defining safety culture it is useful to define what we mean by 'safety'. Antonsen (2009c) defines safety as consisting of three distinct elements:

1. A state or situation in which the statistical risk of an accident is as low as is reasonably practicable.

2. A feeling of security or control, normally in relationship to the presence and effectiveness of safety systems.

3. Practices; this refers to those activities or the use of technology to reduce the likelihood of an untoward event occurring or its consequences.

Within safety culture, as in organisational culture, there are a number of different definitions available from different authors as how to define both safety culture and safety climate. Appendix 2-1 lists 51 definitions of the two concepts from the work of Guldenmund (2000); von Thaden et al. (2004); and Choudhry et al. (2007). These differences indicate why some academics and consultants are frustrated by this apparent lack of conformity and consistency that prevents us making comparisons across organisations and industries. However, other academics particularly those following the work of Martin (2002) would argue that a definition should be constructed to assist in defining and providing the focus for each individual piece of research. I don't necessarily agree with this view as research constraints can be identified and made clear outside of a definition making that definition brief, to the point, and giving it impact. However, I acknowledge that my view may be based more on my experiences as a practitioner rather than from an academic perspective.

Zhang et al (2002, p3) define safety culture as:

> "The enduring value and priority placed on worker and public safety by everyone in every group at every level of an organization. It refers to the extent to which individuals and groups will commit to personal responsibility for safety; act to preserve, enhance and communicate safety concerns; strive to actively learn, adapt and modify (both Individual and organizational) behaviour based on lessons learned from mistakes; and be rewarded in a manner consistent with these values."

Following the aircraft accident involving Continental Express Flight 2574, Lauber (1992) concluded that a contributory cause to the accident included "The failure of Continental Express management to establish a corporate culture which encouraged and enforced adherence to approved maintenance and quality assurance procedures." Zhang et al. (2002) focus on this statement to conclude that a definition of safety culture should include reference to compliance with safety policies and procedures. This is appropriate for an industry where a stable set of processes are designed and the potential for incidents have been anticipated and policies and procedures established and communicated in a controlled environment. However, this does not take account for those incidents that fall outside of the range of anticipated and previously risk assessed for which standard operating procedures have been developed and published. Furthermore it does not consider the potential for multiple procedures to be required to be implemented, sometimes in new sequences, or all at one time, in ways that may not have been anticipated and that may conflict with each other in what is likely to be a complex and uncertain situation.

In attempting to define safety climate Wiegmann et al (2002, p10) reviewed twelve different definitions and from them determined the following definition:

> "Safety climate is the temporal state measure of safety culture, subject to commonalities among individual perceptions of the organisation. It is therefore situationally based, refers to the perceived state of safety at a particular place at a particular time, is relatively unstable, and subject to change depending on the features of the current environment or prevailing conditions."

For this researcher it is this definition by which we should differentiate between culture and climate. The key points to note in this definition is that it is situationally dependent so

will be variable dependent on the circumstances presented by that environment and its conditions. It also incorporates the temporal nature of climate.

2.5 Risk and uncertainty

To develop a feeling of safety one needs to be aware of the hazards or risks one is presented with (Antonsen, 2009c). The term commonly used for this within risk management is 'risk identification', which has led to a new area of research termed situational awareness. But what is a 'hazard', what constitutes a 'risk': and how does that relate to 'uncertainty'?

The Health and Safety Executive define hazard and risk as:

Hazard: A hazard is anything that may cause harm. (Health and Safety Executive, n.d.-b)

Risk: A risk is the likelihood that a hazard will actually cause its adverse effects, together with a measure of the effect. It is a two-part concept and you have to have both parts to make sense of it. Likelihoods can be expressed as probabilities, frequencies or in a qualitative way. (Health and Safety Executive, n.d.-b)

This definition of risk reflects the Health and Safety Executives' focus on risk and its 'downside', not the benefits, that is the 'upside' from taking those risks. It is these two different viewpoints that this researcher believes may be what differentiates between a safety culture and a risk culture.

Certainty and uncertainty: Williams et al. (1995, p5-11; 1998) identify four levels of certainty and uncertainty. Certainty is described as a situation where there is no doubt and outcomes can be predicted with 100% precision: the second is objective uncertainty where outcomes are identified and the probabilities are known; the third is subjective uncertainty where outcomes are identified but probabilities are unknown; and the final level involves outcomes that are not fully identified and probabilities that are unknown.

Douglas (1992) informs us that, in the context of organisations, risk analysis does not address the 'human factor' to the same depth as it does other factors. This may be because although it is seen as a major factor it is difficult to analyse and measure. The human factor element has been viewed by researchers as either being based on the individual or, the

organisational structure and authority in which the individual operates. Neither Sagan's (1993) theory of high-reliability organisations and its focus on the organisation and its systems nor Perrow's (1999) theory of normal accidents address the human factor in great detail. However, other authors, (Reason, 1990; 1997; Dekker, 2005a; 2006; 2007; Dismukes et al., 2007; Reason, 2008) have used human factors as the basis of their research so there is now this body of knowledge available that complements the work of both Sagan and Perrow.

It is the threat of litigation, particularly in the service industries, that has led individuals and organisations to become more cautious in delivering their products or services. Douglas (1992) offers the example of the rise of the adversarial culture that doctors operate in and the threat of being sued. This adversarial culture is summed up by both Douglas (1992) and Dekker (2007; 2012) who believe that the 'blaming system' we currently live in assumes that there is always someone to blame for an adverse event and that the first question asked is 'Who's at fault?' Dekker refers to this as a 'blame culture'.

Previous research has indicated that individuals tend to believe themselves less exposed to some risks than others for which Douglas (1985) uses the term 'subjective immunity'. Douglas informs us that if individuals are carrying out familiar activities of which they are in control then individuals may become complacent and underestimate the probability of a negative or unwanted outcome. Douglas also refers to Slovic et al. (1980) who found that "familiarity often works the other way". Douglas (1985, p30) summarises how we perceive risk in the following terms:

> "Most common everyday dangers tend to be ignored. On the other end of the scale of probabilities, the most infrequent, low-probability dangers also tend to be played down. Putting these tendencies together, the individual seems to cut off his perceptions of highly probable risks so that his immediate world seems to be safer than it is and, as he also cuts off his interest in low-probability events, distant dangers also fade."

This researcher believes that the level of risk awareness, part of the wider concept of situational awareness, becomes dimmed at these two extremes of probability.

2.6 Hot and cold sides of uniformed organisations

Soeters (2000) uses the term 'uniformed organisation' for those organisations representing government authority and undertaking emergency work of a potentially life-threatening

and dangerous nature. Soeters provides us with examples such as the military, the police, and fire departments. The uniform provides an omnipresent symbol of these organisations. To their members the uniform indicates the role, or rank and hence their position in the organisation's hierarchy whilst simultaneously indicating both organisational uniqueness and its stratification (Rafaeli and Pratt, 1993, in Soeters, 2000).To members of the public the uniform indicates authority by which individuals may instruct, authorise, or hold people to account in enforcing certain legislations.

Soeters (2000, p472) likens these military and quasi-military organisations as being two sides of the same coin each with their own subculture and dynamics. On the one side, part of the organisation is focused on preventing problems occurring and establishing the necessary preconditions to enable the organisation's core functions to be carried out efficiently and safely. These core functions are carried out by that part of the organisation, the second side of the coin that conducts its activities on the "street, in a crisis or a battlefield, or responding to a fire". One can make further distinctions between the two sides of an organisation particularly across the common dimensions of "personal risk, the turbulence of critical events, and the time dimension".

Soeters identifies four general situations that will be found in uniformed organisations. These are:

1. Headquarters or staff departments [*such as a FRS Headquarters*]
2. An Army garrison, or a Navy vessel on patrol in peace time [*a fire station*]
3. The activities of police on the street and the operations on an aircraft carrier involved in nonemergency activities [*community fire safety work*]
4. The uniformed organisation in battle, crisis, or disaster [*attending emergency incidents: e.g. fires*]

As you work down this list the levels of personal risk and the turbulence surrounding critical events substantially increases, whereas the time to plan and react is increasingly reduced. Personal risk would include death, physical injury, or of litigation. Items 1 and 2 in the list represent what Soeters calls the 'cold' side of a uniformed organisation, and 3 and 4 the 'hot' side.

The cold side of the uniformed organisation closely reflects that of most organisations where it operates in a hierarchical bureaucratic environment where specialists such as finance and human resources operate using rational decision-making in their strategic planning. The focus of their work is more to do with process rather than being goal orientated. It is this side of the 'coin' that will be in the forefront of dealing with their political masters in power struggles, both internal and external, to the organisation. In their research on volunteer firefighters in the USA Thompson and Bono (1993) found that the volunteers spoke of the "cold organisation" as being that part of their fire department that does not face the heat of fires where conditions are dynamic, dangerous, full of uncertainties and stressful, all occurring in a very short-time span with potentially serious consequences. Soeters (2000) suggests that "real", or full-time firefighters, commonly referred to as whole-time firefighters in the UK, broadened the use of the term 'cold' to include their other activities that firefighters undertake that did not include training for, or attending incidents (item 3, in Soeter's list of general situations). Another characteristic of the hot side of a uniformed organisation is the mentality of it being a "can-do" organisation in reference to its ability to adapt and deal with the situation. This adaptability and flexibility is seen by members of a fire station culture as being more important than having plans and procedures which normally can't cover every eventuality. Soeters informs us that the culture of uniformed organisations is generally seen to be competitive and that those staff operating on the hot side will often use the term "them and us" to differentiate between themselves and others including members of the public, managers in the cold organisation, and politicians. Unlike the cold organisation, the hot organisation is built around flexible groups usually having the characteristics of a simple structure with a single leader (Soeters, 2000).

Jacobs (1992, in Soeter, 2000, p475) introduces us to the term 'Guardian morale syndrome' which she uses in the context of Street-cop culture, troops on the battlefield, and firefighters attending a fire. The term relates to the role these hot uniformed organisations undertake in which they want their members to be "courageous, obedient, loyal, and traditional". With this comes the downside that it is also seen to be "exclusive, vengeful, and ostentatious".

Soeters (2000) believes that it is those on the 'hot' side of the organisation that will determine the command philosophies of uniformed organisations which he attributes to

their accumulation of experience and lessons learned from a host of different types of operations which they have been exposed to and learned from.

2.7 The three generic subcultures

Schein (2010) identified three generic hierarchical subcultures that allow us to analyse the culture of an organisation; the executive, the designer, and the operator. Between these three subcultures conflicts or tensions can arise that can prove to be destructive in their nature. Whilst we might perceive these tensions to be the result of political in-fighting, struggles for dominance, or personality conflicts, they may be the result of one or more subcultures having developed in a sufficiently different way that they are now in conflict with each other. To achieve the organisation's goals and objectives Schein informs us that it is critical for the leader, or leaders, to bring these three subcultures into sync with one another.

Executive

Schein (2010) informs us that the executive subculture refers to those top managers across different organisations that operate in similar environments and contend with similar concerns. The executives operate at the board level where their primary concern is the financial well-being of the organisation to ensure the organisation's survival, continued growth, and meeting the expectations of the organisation's shareholders and key stakeholders. This reflects the levels of responsibility and accountability held at these levels and from which their managerial role is performed at a distance from the workforce. With this distance they are forced to consider the process of management as controlling activities by the use of systems and procedures.

An executive's status is seen as an indication of their success and is reflected in the role and place in this organisational hierarchy. Staff are considered as a resource that can be recruited and managed for they are viewed as a source of problems rather than as potential solutions. These assumptions are more likely to be found in the attitudes of those executives who have risen through the ranks to their current position or role (Schein, 2010). The executive, whether new to the organisation or having spent an entire career in that one organisation, will now identify with what Schein (2010) and Rojot (2008) refer to as an 'occupational reference group' outside of the organisation. He provides the example of

whilst conducting executive programmes for executives, he found they will only attend if other executives will be in attendance. Use of an occupational reference group can be expected to have influenced the introduction of bonus schemes and other rewards that many executives, including those in the public sector, have now come to expect.

Designers

The engineering/design subculture consists of the group who are responsible for the design and the use of the technology being used within an organisation. It is this focus on the use of technology, work experience, and their specialist education that influences their basic assumptions, which sets this occupational group aside from the executives and the operators. Human intervention or interaction can be reduced by automating the systems, therefore reducing the need for human interaction from operators to a series of standard responses. Their work is focused on producing, in an efficient and safe manner, useful products and outcomes (Schein, 2010). Using this description there are no designers in the FRS. However, Watch, station and group managers are responsible for designing the temporary command structures and implementing the appropriate processes to ensure an efficient and safe response to meet the desired outcomes at an incident. Area managers and principal officers (the executives) would be excluded as, in most circumstances, they inherit and work with the 'design' that has already been established prior to their arrival.

Operators

The subculture of the operator relates to those members that are in the front-line of the organisation. Schein (2010) informs us that the operator subculture is based on how work within an organisation is done and that this subculture will often prove to be the most important contribution to organisational culture. Within an organisation there is likely to be a number of different operator subcultures and it is the interaction between them that allows us to observe what Schein terms as the informal culture of the organisation.

The basic assumptions of the operator subculture include the view that the organisation is dependent on the actions of the operators; they are the critical resource; and it is their skills, knowledge, abilities, experience, and commitment that ensures organisational success. In times of emergencies or equipment failures, when procedures and routines are not sufficient to deal with the situation, it is these operator qualities that will be called

upon to recover the systems, built by the designers, bring them back online. This may require the operators to demonstrate their ability to learn about these systems and their role so that when these unplanned events occur they are able to innovate when necessary. To enable the operators to carry out their work efficiently and safely they are dependent on management to provide the required resources, the appropriate training, and their continued support. Schein (2010, p55) informs us that shared assumptions “most often form around the functional units of the organisation". It is the shared tasks, and the derived experience, that enables a set of shared assumptions to evolve. Schein uses the term "subculture of first-line supervision" when a supervisor discovers and introduces new ways of successfully managing their staff. Experienced supervisors will provide a mentoring role, formal or informal, to new members providing a form of training that is "more powerful, or beneficial, than any formal training".

The three sub cultures of executive, designer, and operator will often be found to be working at cross purposes, sometimes creating a hostile work environment within an organisation. Meyer and Rowan (1977) also identify three levels within an organisation that can be equated with those of Schein. The first level is that of the ‘top echelon’ whose focus tends to be on becoming a ‘good’ organisation in accord with the current values at that time; the second is that of managerial hierarchy that produces the policies and procedures to reflect the managerial and occupational requirements; and finally, there are the other parts of the organisation that ignores those policies and procedures and focuses on carrying out their work in the most efficient manner.

Schein (2010) informs us that of the three subcultures it is that of the operator that is most difficult to describe, which he attributes to the development of this subculture at the level of operational or functional units making up each organisation. To achieve their tasks in the most efficient way those working within the operator subculture quickly learn that communication, trust, and teamwork are essential. Schein informs us that:

> “Operators also learn that no matter how clearly the rules are specified of what is supposed to be done under different operational conditions, the world is to some degree unpredictable and they must be prepared to use their own innovative skills to deal with it… because conditions are never quite the same as what the training had shown, all operators learn how to deviate from formal procedures, usually to get the job

done but sometimes to subvert what they may regard as unreasonable demands from management" Schein (2010, p59).

Snook (2000, p182) uses the term 'practical drift' to describe this gradual change from prescribed procedures and Schein (2010) labels the activity as 'practical action'. From a cultural aspect if this gradual adaptation of rules and procedures is found to be successful it is then normalised and will be taught to new members of the operator subculture. Schein (2010) informs us that it is this practical drift that will always allow sociologists working in organisations to find examples of the 'informal organisation'. In Snook's research practical drift can be judged as having had a negative outcome when two US helicopters were shot down by two US aircraft resulting in multiple fatalities. However, Schein (2010, referring to Hughes, 1958; Dalton, 1959; van Maanen, 1979) and Reason (1997) point out that an organisation might not be as effective without operators using their 'innovative behaviour' to achieve positive outcomes. Instead of 'practical drift' Dekker (2006) uses the term 'procedural drift' and suggests that there are two ways at looking at this phenomena; either as non-compliance, or alternatively, as an example of adapting procedures to meet a certain set of conditions at that time. Dekker informs us that how we choose to perceive this procedural drift will depend on the position we take, i.e. as an outsider to the subculture, or as an insider. From the outsider's perspective any non-conformity with rules and procedures can be labelled a 'violation'. However, as an insider, this behaviour may well be considered as conforming to a new norm that has developed over time as how to complete a task within time constraints, or with few resources, and may be seen as demonstrating expertise based on experience. If no adverse consequences occur then beliefs will be modified and subsequent behaviour will change based on a change in the subculture. Reason (2008) describes the situation as either the individual being viewed as a hazard, or as a hero whose ability to adapt and compensate has enabled the affected 'systems' to be rescued at the point of catastrophic failure. Reason (2008, p4) does however, caution us that "Even the best people have their bad days".

Dekker (2006) summarises this situation from the perspective of non-compliance with procedures as: "At a particular moment in time, behaviour that does not line up to some standard may look like complacency or negligence. But deviance may have become the new norm across an entire operation or organisation". The continued success may have been at the cost of increased exposure to risks that the group may not have even been aware of

depending on their risk assessments and situational awareness: “people don’t always do what they are supposed to do” (Dekker, 2006, p2).

Dekker (2006, p168) informs us that “safety is really the only goal that governs what people do. Most complex work is characterised by multiple goals, all of which are active or must be pursued at the same time… most of these goals will somehow be at odds with one another most of the time, producing goal conflicts.” He highlights that organisations will nearly always cite ‘safety’ to be their number one goal but there will always be other competing goals. Dekker (2006, p169) identifies the following causal factors for competition between goals:

- Management policies
- Earlier reactions to failure (does the organisation operate ‘just’ and ‘learning’ cultures, or does it operate a ‘blame’ culture?)
- Subtle coercions (do what the boss wants, not what he or she says)
- Legal liability
- Regulatory guidelines
- Economic considerations

Added to these factors are the operators themselves who may have their own vested interests such as “career advancement, and avoiding conflicts with other groups” (Dekker, 2006, p170). To this I would add seeking the respect of one’s peer group and that of management, and pressure from subordinates or external stakeholders to quickly complete the task in hand.

2.8 Culture as a metaphor or as a variable?

The question as to whether we should view culture as a metaphor or a variable has long been an issue that has divided researchers and highlights the importance of the work of Smircich (1983) in distinguishing between the two viewpoints (Martin, 2002). Smircich believes that it is the different basic assumptions that researchers make of the conceptions of organisations and culture that leads to different focus of interests and questions being

asked in their research. Smircich identified three modes of inquiry; the first is when culture is viewed as a variable so as to make comparisons, which follows the functionalist paradigm (Burrell and Morgan, 1979, referred to in Smircich, 1983). To view culture as something that can be measured represents a functionalist viewpoint, which sees culture as something an organisation 'has'. The view put forward by Schultz (1995) is that in conducting climate research a more functionalist approach is taken, viewing culture as something an organisation 'has' and useful in making predictions. The second is that of culture as a root metaphor when seeking to conceptualise an organisation. In this view culture is seen as something an organisation 'is' and that an organisation consists of a series of subcultures to be explored. The root metaphor focuses on framing research as viewing the organisation as a social phenomenon with "a pattern of symbolic relationships and meanings sustained through the continued processes of human interaction… (*With a focus on*)… language, symbols, myths, stories and rituals" (Smircich, 1983). The final view is of culture as a root metaphor in making comparisons. Much of the research using this viewpoint has been either descriptive or documentary which Smircich informs us is an epistemological device with which to frame the study of organisations as a social phenomenon. However, if conducting cultural research the viewpoint is that culture is something an organisation 'is' and an in-depth study to gain an understanding of the participants' working lives is undertaken, which views an organisation's culture as a range of different subcultures interacting with one another with a focus on symbolism.

2.9 Single perspectives of culture

Martin (1992, 2002) informs us that most researchers in organisational culture have adopted one of three perspectives of culture and that there is disagreement between researchers as to which is the more appropriate to use. These three perspectives are those of integration, differentiation, and fragmentation. The integration perspective focuses on cultural manifestations and how they are interpreted consistently across the organisation. Martin points out that this consensus across the different cultural groups does not imply unanimity but that the consensus of interpretation is clear with no ambiguities. The integration perspective has been criticised due to inappropriate sampling frames being used to support results being generalised across an organisation as the claimed harmony and homogeneity across the organisation. Critics of the integration perspective believe it is compromised by "inconsistencies, disruptions, conflicts, and ambiguities" that arise are

then ignored (Martin, 2002, p96). Martin, however, in defence of the integration perspective, cites Schein (1985) and Barley (1983) in that beneath this apparent lack of consensus in integrative manifestations we may find consensus at the deeper level of basic underlying assumptions. Although there may be consensus in integration it tends to be within subcultures where each subculture "may exist in harmony, independently, or in conflict with each other. Within a subculture, all is clear; ambiguity is banished to the boundaries between subcultures."(Martin, 2002, p94). To focus on a single subculture would be to utilise the integration perspective.

In contrast to the integrative perspective the differentiation perspective looks at the differences or inconsistencies as to how manifestations have been interpreted. These are not necessarily seen in a negative light as instead of being ignored by the researcher they become a focus for attention (Martin, 2002). It is common for differentiation studies to include a range of different subcultures which may include hierarchical structures, such as Schein's (2010) executive, designer, and operator categories; professional subcultures; functional or divisional subcultures; differing levels of access to power; or subcultures based on gender or race. The boundaries between the different subcultures are permeable and ill-defined, which make them more easily influenced, and for them to influence, other subcultures within the organisation (Rojot, 2008).

Finally, there is the fragmentation perspective, which has ambiguity as its focus, which goes beyond ignorance or confusion to include the tensions resulting from opposing sides in polarised thinking. Rojot refers to Weick (1979) and his concept of loose coupling between subcultures which encourages ambiguity that then leads to heightened levels of uncertainty and complexity. Martin (2002) uses the terms 'unease, paradoxes, or contradictions' to describe these tensions, and offers as examples of the use of ambiguity the findings of Alvesson (1993), DiMaggio (1997), Gherardi (1995). Both the differentiation and fragmentation perspectives have been criticised for their tendency to ignore the interpretations and beliefs that are shared between cultural members.

Table 2-3 compares the three single-perspectives in regard to the three cultural dimensions of consensus, manifestations, and ambiguity.

Table 2-3. Complementarity of the three theoretical perspectives in regard to the three cultural dimensions.

Cultural dimensions	Perspective		
	Integration	Differentiation	Fragmentation
Orientation to consensus	Organisation wide consensus	Subcultural consensus	Lack of consensus
Relation among manifestations	Consistency	Inconsistency	Not clearly consistent or inconsistent
Orientation to ambiguity	Exclude it	Channel it outside sub cultures	Acknowledge it

Source: Adapted from Figure 3 in Meyerson and Martin (1987); Table 1 in Martin and Meyerson (1998); and Table 1.1 in Frost, Moore, Louis, Lundberg, Martin (1991; in Martin, 2002).

Each of the three cultural perspectives has its own strengths and weaknesses. Martin (2002) advocates a research perspective that uses all three perspectives simultaneously to utilise the strengths of each perspective, whilst negating the weaknesses of the other two perspectives. By utilising the three perspectives of culture a researcher can look to achieve a greater, in-depth understanding of the culture being researched. Martin terms this approach the three-perspective theory of culture. Martin (2002) identifies three levels of analysis; organisational, subcultural, and individual in relation to using a combination of the three perspectives which is summarised in Table 2-4.

Table 2-4. Levels of analysis and the three perspectives.

	Perspective		
Level of analysis	Integration	Differentiation	Fragmentation
Organisational	Consensus throughout the organisation; goal assimilation and conformity.	No organisation-wide consensus; organisation is cluster of sub cultures.	Issue-specific attention with no consensus; patterns of issue activation influx.
Subcultural	No important subcultural differences; subculture can represent whole	Relation of sub cultures can be: Enhancing Conflicting Independent	Subcultural boundaries uncertain, fluctuating, blurred, nested, overlapping.
Individual	Self unified, constant, a member of the culture.	Self composed of multiple subcultural identities.	Self fragmented, influx; no central unity.

Source: Martin (2002, p152)

In this research a fire and rescue service relates to the organisational level; safety culture is at the subcultural level; and the three generic subcultures of executive, designer, and operator are used at the individual levels.

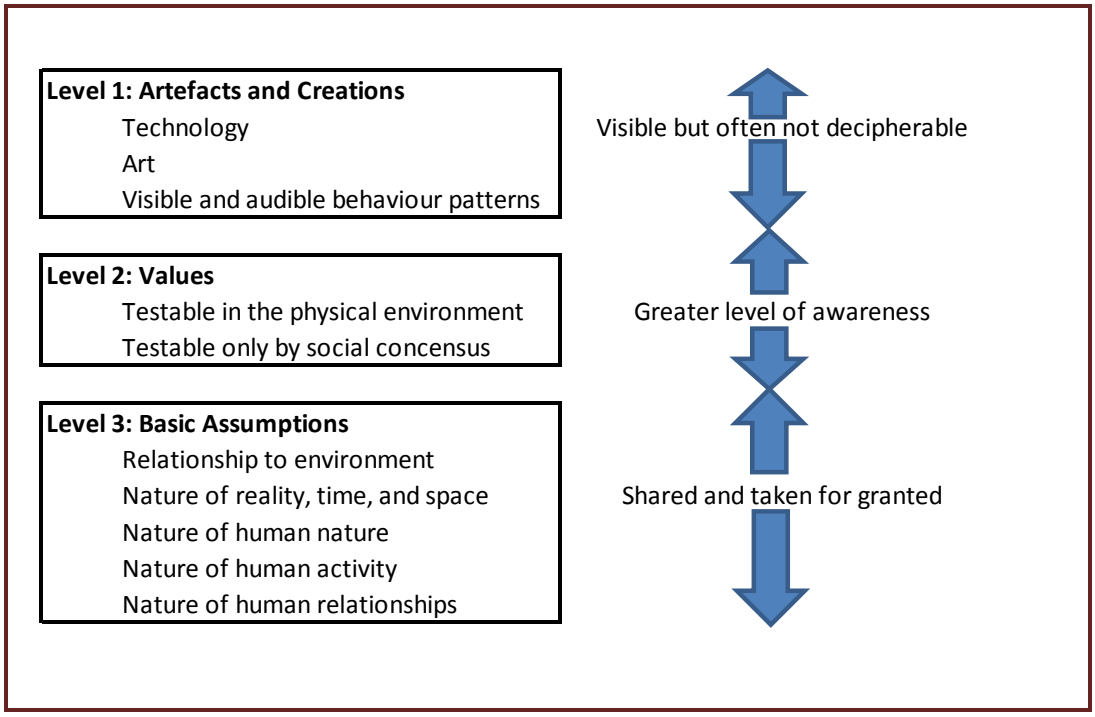
This research adopts Martin's (2002) preferred approach to cultural research of utilising the three individual theoretical perspectives of integration, differentiation and fragmentation. The first perspective of Integration relates to harmony, or consistencies between groups whilst differentiation focuses on their conflicts. The final perspective of fragmentation relates to the ambiguity, the paradoxes and the contradictions between those groups. By using all three perspectives rather than selecting one individual perspective the researcher can utilise the combined strengths of each to mitigate the weaknesses associated with the individual perspectives.

2.10 Levels of culture

Culture can be divided into a number of different levels with various authors mentioning the tangible, or intangible, aspects or the surface phenomena and the hidden aspects of culture. Each level of culture provides a means by which we can study an organisation or group. Probably the most often quoted work on these different levels of culture is the work of Edgar Schein.

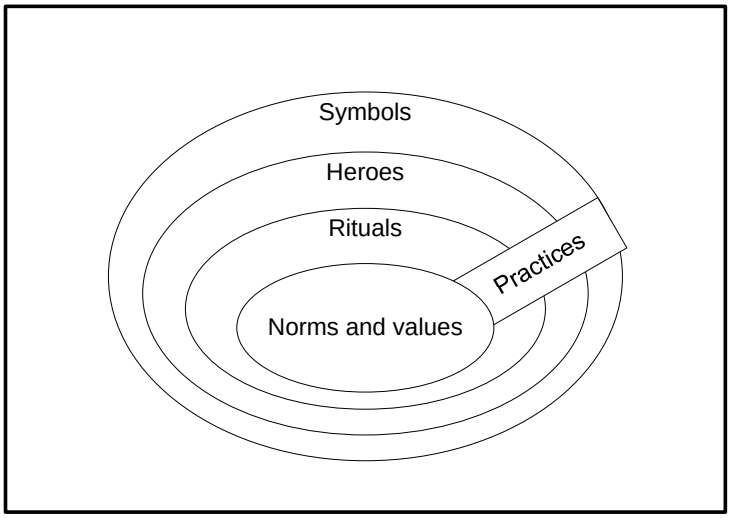
Schein (2010) identifies three levels of culture that can be used in an analysis with each level representing the degree to which the manifestation or phenomena can be observed. These are shown in Figure 2-1. Other authors such as (Tropenaars and Hampden-Turner, 1999; in Mullins, 2005; Hofstede et al., 2010) opt to use an 'onion' to display their models as does Hofstede (2010); see Figure 2-2.

Figure 2-1. Schein's three levels of culture.



Source: Jung et al., (2007) based on Schein (1989)

Figure 2-2. Hofstede's conception of culture as consisting of layers.



Source: Hofstede (2010, p8) based on his research on national cultures.

As we can see in Hofstede's model of culture (Figure 2-2) the norms and values are placed at the centre of the 'onion' where they cannot be seen until you slice through the outer layers. His next layer is that of rituals followed by the 'heroes' of the organisation or group. The outermost layer is that of symbols, the most readily observable of all the different layers. Guldenmund (2000, p224) believes that Hofstede's interpretation of organisational culture is that it is only the outer layers of symbols, heroes, and rituals, which Hofstede calls practices, that are relevant. However, this is not evident in the later work of Hofstede et al. (2010) in which the authors identify the outer layers as practices due to their being visible to the outside observer. The cultural meaning represented by the norms and values remains hidden from external observers and can only be interpreted by insiders from the culture.

Different authors may refer to the core of the culture as either being norms and values, basic assumptions, or basic underlying assumptions. Schein (2010) prefers to use the term 'assumptions' as opposed to 'values' on the grounds that values can more easily change and are subject to challenges, whereas assumptions are taken for granted and are therefore not open to negotiation. Anyone that did wish to challenge these assumptions would risk being ostracised and excluded from that cultural group.

When reviewing how both Schein and Hofstede have layered and labelled their visions of culture Guldenmund (2000) highlights the care with which Schein has labelled his outer layers of espoused values and artefacts, which Guldenmund believes reflect the view that what we see, or are being told, does not always reflect the reality of the culture. It is for this reason that Schein does not include behaviour as a cultural expression. Guldenmund (2000) summarises the use of different levels of culture and how they had previously been labelled in Table 2-5.

Table 2-5. Culture and its layers as presented by different authors.

Author	Central core	Layer 1	Layer 2	Layer 3
Deal and Kennedy (1982)	Values	Heroes	Rites and rituals	Communication network
Hofstede (1986, 1991)	Values	Rituals	Heroes	Symbols
Saunders and Nuijen (1987)	Values	Rituals	Heroes	Symbols
Schein (1982)	Values and principles	Rituals	Heroes	Symbols
Van Hoewijk (1988)	Fixed convictions	Norms and values	Myths, heroes, symbols,	Codes of conduct, rituals,

Source: Guldenmund (2000)

Martin (2002), in introducing her use of the term 'contents theme' to describe the interpretations of a grouping of a number of cultural manifestations, informs us that these content themes can either be based on beliefs or tacit assumptions (cognitive), or on values (attitudinal). So here we see an alternative way of differentiating between the terms 'assumptions' and 'values'.

During our lifetimes we will be exposed to, and become the members of different cultures and adopt their underlying assumptions that will affect how we interpret our surroundings. Hofstede et al., (2010) highlights the more common cultures that will influence us during our lifetimes as being national, regional, ethnic, religious, gender, generational, social class, employment, role, and profession.

Artefacts

The top or outermost level of Schein's model of culture is that of 'artefacts', which are the most readily observed. Artefacts would include the physical working environment; organisational structural and hierarchical charts; the language being used; the technology, products, or service provided; corporate uniforms or dress codes; personal protective equipment; the perceived level of competence of service being provided; symbols of authority; relationships between hierarchical roles; the myths and stories about the organisation and individuals; an organisation's values often stated in the mission statement, goals and objectives; and the rituals and ceremonies (Rafaeli and Worline, 2000; Schein, 2010). These examples reflect the structures, the processes, and the observed

behaviour within the organisation or group being studied. Schein (2010) informs us that it is these artefacts that will inform us about the 'climate' of the organisation or group that is being observed. However, he warns us that although relatively easy to observe, to describe the artefact and to report the feelings associated with it can prove difficult in deciphering what these artefacts mean in reality to those being observed. Hofstede et al. (2010) inform us that cultural differences can be represented in many different ways but believes the categories of symbols, heroes, rituals, and values cover the majority of these different manifestations.

Symbols

Rafaeli and Worline (2000, p73) define symbols as being:

> "things that can be experienced with the senses and used by organisation members to make meaning. Symbols are noticed through sight, sound, touch, and smell. They are experienced as real, and their impact has significant organisational consequences. Things such as organisational layout, organisational landscape, and corporate uniform or dress are examples".

Schein (2010) informs us that the meaning associated with symbols are likely to only be recognised by those who share the culture, and that older symbols are likely to be replaced by new symbols which may well have been copied from other cultures. Gagliardi (1990; 1999, in Schein, 2010) informs us that the meanings associated with symbols can only properly be interpreted by someone who has been immersed in that culture at the deeper level of assumptions. Schein adds to this that the interpretation of meanings will be biased in favour of the researcher's own experiences and assumptions rather than the meanings inferred by organisation members. This can be overcome if the researcher has lived in the group for an extensive period of time during which the meanings attached to the artefacts have become clear. Failing that the researcher must talk to the members of the organisation or group themselves in order to analyse "the espoused values, norms, and rules provide that day-to-day operating principles by which the members of the group guide their behaviour" (Schein, 2010, p25). Rafaeli and Worline (2000, p73) inform us that symbols "acquire their meaning in the organisation through recurring experiences". They have determined that symbols have four functions within an organisational culture that together integrate feelings, thought, and action initiated codes of meaning. The first function of a symbol, reflecting the culture, is based on symbols being observable and

tangible expressions of the shared reality of organisational members. Gagliardi (1996, in Rafaeli and Worline, 2000, p75) informs us that symbols represent what is “tacitly known and yet unable to be communicated by an organisation's members", and it is through our interpretation of the symbols and the meanings they generate that we gain a cognitive understanding of the organisation. The second function relates to when the symbol acts as a trigger to access the internalised values and norms to guide our subsequent behaviour. Research conducted by Katz and Kahn (1978, in Rafaeli and Worline, 2000, p76) demonstrates “that people often act out the role in which they are placed”. This might be found in language such as ‘putting on your management head’, or ‘your technical head’ when an individual changes their behaviour to that associated with the role. Rafaeli and Worline (2000) use the analogy of a ‘bridge’ in that the first function provides the means by which a symbol bridges feeling of thought, so that it then becomes a symbol of influence in eliciting the correct learned behaviour in that situation and context. The third function is when symbols act as a framework for use in conversations about our experiences. Kaplan and Kaplan (1983) inform us that we construct and associate meaning with a situation through our expectations based on previous experiences. When we find our expectations are not met in reality then we are left with feelings of uncertainty and insecurity. However, if those expectations are met in those frameworks based on experience they are largely invisible to us. It is this third function that can be used to make these frameworks visible and then used to discuss and understand what is behind these discrepancies between expectations and reality using a common language familiar to that particular culture. The final function is where a symbol operates to integrate different organisational systems of meaning. Rafaeli and Worline (2000, p81) argue that in this fourth function “symbol integrates multiple, competing, and potentially even conflicting systems of meaning in an organisation”, and it is this integration of different systems of meaning as to why a researcher cannot focus solely on a specific symbol. Rafaeli and Worline warn us that at different points in time this integration of symbols may be either absent or weak, reflecting potential clashes of culture within an organisation. As each cultural group learns from its experiences it develops new learning and their meanings and symbols will evolve. This difference in exposure to new experiences can be the cause of subsequent tensions and conflict between these cultural groups both within and external to the organisation’s environment.

It is only by recognising the connection between symbols or artefacts, via the underlying beliefs and values, that we will gain an understanding of the culture (Pondy et al., 1983; in Rafaeli and Worline, 2000). In seeking to identify consistency in use and the connections between symbols and organisational values the researcher has three responsibilities: to recognise the symbols in a specific context; to unravel members' interpretations in this context; and to verify across multiple members the reliability of these interpretations (Rafaeli and Worline, 2000).

Heroes

Organisational 'heroes' can be based on persons currently within an organisation, persons who have left the organisation, or they may be based on imaginary figures. Such 'heroes' are seen to possess the characteristics most valued within that culture and by individuals who would themselves aspire to behave in ways similar to these heroes (Hofstede et al., 2010).

Story-telling

Specific events or incidents and the behaviour of leaders are often the subject of organisational stories. Weick (2010) tells us that stories are used to reinforce the underlying assumptions with cultural members and to teach to new members, but the messages within the stories are likely to be highly selective and ambiguous making them an unreliable source. Leaders and managers cannot control what will be said about them in the stories but they can be used as a means to get their message across the organisation. Weick warns us that using stories to decipher a culture carries the same risks as using rituals in that the researcher cannot always correctly identify the point the story is making and would require some form of triangulation before making assumptions as to the purpose of the story.

Flin et al. (2008, p62) inform us that within different occupations such as that of pilots, the police, traffic controllers, military officers, firefighters, and medical staff working in operating theatres "like nothing better than exchanging 'war stories' with each other". In the experience of Flin et al. war stories tend to be exchanged, or shared, in relaxed social environments during work, or after work, in places such as corridors or coffee rooms. They report that from sharing these war stories "significant learning in these occupations is achieved by sharing experiences in this way."

Baigent (2001) found in his research into the UK FRS that story telling was an important means by which to discuss experiential knowledge gained from their own experiences and of stories passed onto them from others. He identified that the Fire Service College (FSC) had an important function in the sharing of stories particularly between students during their 'landing parties'. This refers to the informal gatherings of students on the landings of their accommodation where alcohol and stories were shared. Baigent identified that stories were also shared between instructors and students and between instructors. The FSC however, no longer plays such a pivotal role in the sharing of stories as many FRSs no longer send their operational staff to the FSC in the numbers they used to due to the incurred costs and the demands of austerity on FRS training budgets.

Flin et al. (2008) inform us that professionals will retain these stories and accounts and add them to their own repository of mental models for use in their own work environment. When discussing the subject of operational decision-making within the US fire service, Okray and Lubnau (2004, in Flin et al., 2008, p62) emphasise that:

> "one of the most effective training programs that exists in every fire Department is the storyteller… These boring old firehouse stories that get told over and over again are a way of sharing our experiences with other firefighters… Through the accurate use of storytelling, we can increase our ability to respond to fire scenes."

Klein (1998), a leading researcher into decision-making, has advocated the use of story-telling to enable decision-makers to build an expertise based on the experiences of others that they might not otherwise have had the opportunity to experience themselves. This allows them to understand and make sense of situations they may find themselves facing and they can apply the lessons learned by others. Each story contains a number of different lessons and helps to preserve the values of the cultural group as well as familiarising new members with the type of environment they will be working in. Klein informs us that we not only like to tell stories but we like to hear them, again, and again as each re-telling reminds us of the lessons learned. The use of 'war stories', or storytelling, has proved useful in developing individuals and teams in regard to their adaptive behaviour. Joung et al. (2006) introduce us to how war stories can be used within the formal structure of an organisation. They conducted their research into the use of 'war stories' using 59 Australian station officers (each in charge of a shift at a station) within the New South Wales Fire Brigade whilst they were undertaking training for incident command. They compared and evaluated two training methodologies in which the first was based on using case studies of

incidents at which errors had been made resulting in severe consequences. The second group used the same case studies but each incident was depicted as having had no errors and hence no consequences. Joung et al. call the first training methodology error-story training and the second errorless-story telling. They found that participants given the error-filled war stories were able to generate more appropriate alternative actions at different stages in the case study and identify a wider range of problems that were evident. Joung et al. believe that it is this cognitive skill that acts as a precursor to adaptive behaviour. Holgate and Clancy (2009) promote the use of story-telling for the sharing of what they call portal experiences and the benefits of sharing 'near-miss' events, or risk experiences, with others to encourage firefighters to take seriously the life threat presented on the incident ground.

Rituals

Rituals are activities held within a culture that are not necessarily required for structural purposes or in completing processes, but more often will be found to be fulfilling a social need. Hofstede et al. (2010) provide examples including how members of a culture may greet each other and pay respect between each other and to others external to their own culture. Within this category of rituals we might include discourse between cultural members such as the language being used, interactions occurring on a daily basis, and in communicating their cultural beliefs.

Espoused beliefs and values

Espoused beliefs and values, and desired behaviour, may not always be reflected in the behaviour being observed in reality. As beliefs and values are derived from the successful outcomes of previous actions, then untested beliefs and values will be the subject of questioning, debate, and will ultimately be challenged. Schein (2010) informs us that as the group observes success associated with the new beliefs and values of the leader, they will adopt and share them, and use them to guide their own behaviour and that of new members to the group on how to act particularly in times of uncertainty or when facing difficult situations. Over time, with repeated successes, these shared beliefs and values will become shared assumptions; otherwise they will remain espoused beliefs and values. Those group members who do not adopt 'socially validated' beliefs and values are likely to expose themselves to being excluded, or ostracised, from the group in the same way as in

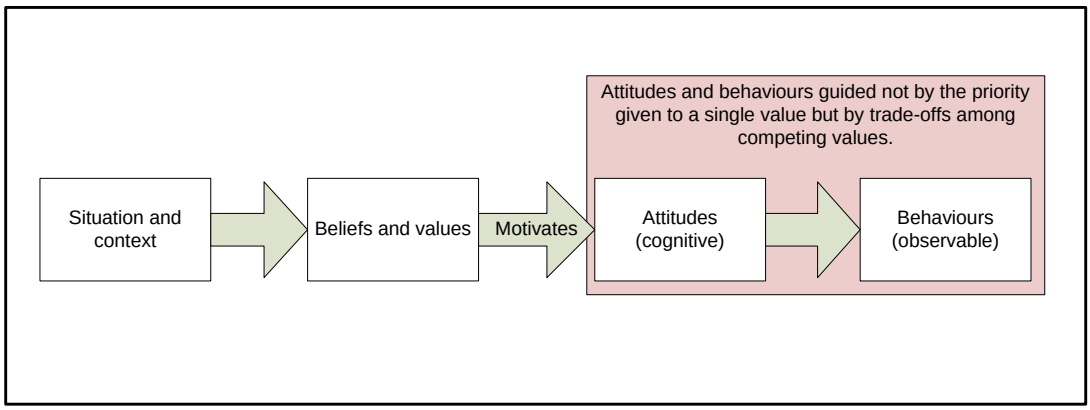
"Groupthink". This is where a group may display excessive optimism and hence risk-taking behaviour; a willingness to discount information that contradicts their beliefs, associated with a negative response to those who challenge their beliefs, which may result in pressure being applied to individuals or smaller groups (Janis and Mann, 1977; Janis, 1982; , in Mullins, 2005). Hambrick (2001; , in Mullins, 2005) warns us that "Groupthink tends to occur when group members have very similar experiences and frame of references, particularly when they have relatively long tenures in a group. A company head who dislikes conflict or who punishes dissenters also creates the conditions for groupthink." This would describe the situation within many FRSs at both the principal officer and watch-based levels and one that a number of interviewees certainly associated with.

Martin (2002) informs us that content themes can be either espoused, or inferred deductively. This refers to the potential superficiality of espoused themes of the members of the culture that may only be designed to meet the expectations of a specific audience at that time. This is in comparison to their observed behaviour based on the reality of how they interpret their environment, which may be very different to what they may have espoused.

In some cases these content themes may be sincere and accurately reflect an organisation's activities, or alternatively, they may just be corporate propaganda that bears little relationship to the reality of what occurs in the organisation. For the researcher it is the content themes that are inferred deductively that will provide the in-depth analysis in cultural research.

At this point it would be worthwhile outlining the relationship between values, attitudes, and behaviours. These are shown in the following Figure 2-3 in which we can see that the situation and its context will determine which particular beliefs and values come into play. These in turn provide the motivation, in regard to our attitudes that we adopt, and ultimately our behaviour and our actions.

Figure 2-3. Relationship between values, attitudes, and behaviours.



Source: Based on Schwartz (1996, in Stackman, 2000)

Kilman (1981, in Stackman, 2000, p38) reviewed the various definitions of 'values' and he found in general, across these definitions, values were found to be "objects, qualities, standards, or conditions that satisfy or are perceived to satisfy needs and/or that act as guides to human action". This conforms with the conclusion of Rokeach (1969, in Stackman, 2000, p38) in that "values entail attention to both means (such as acts) and ends (such as outcomes of various sorts)". Connor and Becker (1994, in Stackman, 2000) also refer to end states, or outcomes, as part of the attitudinal process for making decisions. Stackman makes the point to stress that "values are neither attitudes nor behaviours" but they are the basis for our behaviour and the choices we make, whereas attitudes are cognitive and would affect our perceptions in certain situations. Behaviour is the observable output based on one's values and the associated attitudes (Stackman et al., 2000). Whereas values will apply in all situations our attitudes will vary between "specific objects, persons, institutions, and situations" (Stackman et al., 2000).

Research conducted by Seligman and Katz (1996, in Stackman, 2000) inform us that if we consider the presence of a multiple value-system is at work, e.g. that of a family value system and the work value system, then the overall value system will be dynamic in nature and which values the individual refers to will be dependent on the context of the situation at that time. It is the context of a situation that will determine our behaviour based on our beliefs of how to behave (Rafaeli and Worline, 2000). Because of the learning process by which we develop our beliefs and values then depending on the context a specific value system will be stable yet flexible when informed or influenced by the general value system.

Attitudes are associated with particular processes. The first is the learning process which Stranks (2007) refers to as the conditioning process from which a single response is required. The second process is that of reinforcement and closely associated with reward or punishment as a group's espoused beliefs and values may not always readily be associated with the behaviour being witnessed. It is then necessary to look at the deepest level of understanding that of basic underlying assumptions (Argyris and Schon, 1978; 1996, in Schein, 2010).

Basic underlying assumptions

Schein informs us that basic assumptions are similar to what Argyris and Schon (1974; 1978, in Schein, 2010) identify as "theories-in-use" that guide the behaviour and perceptions of events as they occur. Basic assumptions are shared between the members of the group with little variation, and because they are so deep-seated it does not occur to group members to challenge these assumptions while they continue to be successful in their use, with the behaviour of individuals mutually reinforcing those assumptions. Basic assumptions prove very difficult to change because the change process affects both the group and its members, which in turn causes an increase in uncertainty and levels of stress. Rather than facing increased levels of uncertainty and stress there is the tendency to want to interpret events as conforming to our basic assumptions even if that requires individuals to "distort, deny, or rationalise in some way their situational awareness, or appreciation, of what is occurring" (Schein, 2010, p29). When events do not conform to our basic assumptions individuals are left open to feelings of vulnerability, are unable to understand the situation, and are likely to misinterpret the actions of others (Douglas, 1986, in Schein 2010; Busche, 2009). It is at this level of the basic underlying assumptions that members of an organisation or group will derive their basic sense of identity and the values on which their self-esteem is based (Hatch and Schultz, 2004, in Schein 2010). The stability of a culture is dependent on maintaining those basic assumptions, which may be affected as new members come into the organisation or group with a set of basic assumptions related to their previous roles, experiences and education. In these situations there will be a modification of the basic assumptions, or even new ones develop, if they prove valid during what will be a learning process.

Models of safety culture

Guldenmund (2000) criticises a number of previous researchers in that they did not identify the model of culture they were using. A number of models for safety culture had been proposed by different authors. Pessemier and England (2010) in their research into the safety culture of the US fire service used a modified version of the Reciprocal Determinism Model (Cooper, 2000) which used the independent variables Safety Management System, and Safety Related Behaviours, with the dependent variable Organisational Safety Climate. Antonsen (2009) suggests two different theoretical perspectives, Turner's Man-Made disasters, and that of the High Reliability Organisation. Guldenmund (2000) refers to the potential of using Reason's (1997) model of Safety Culture and its relationship with the associated cultures of reporting, learning, flexibility, and just cultures. Cooper (2000) refers to reciprocal relationships identified by different authors such as Heinrich (1980), Cohen (1977); Smith et al. (1978), and (Bandura, 1977; 1986) who all identify three common factors; behaviour, the situation, and person factors in a similar way to that used by Pessemier and England (2010). However, for his research Guldenmund elected to use Schein's model of three layers for its simplicity. For this research I agree with, and have adopted, Guldenmund's view that Schein's model of three levels of culture: artefacts, beliefs and values, and basic underlying assumptions, in that it provides a simple model that most people would be able to understand instinctively.

Reason describes his model of safety culture (1997, p196) as including a number of subcultures which he labels as the reporting, learning, flexible, and just cultures. I would also add to the list that Reason provides by including the organisation's risk culture. Using systems theory I would argue that these 'subcultures' are not subordinate to safety culture itself but are cultures in their own right. We can view safety culture as an open system that interacts with and influences other cultures and subcultures in its environment and it is the interrelationships between them that is the important factor. There is also a hierarchical aspect to safety culture and other cultures relating to Schein's (2010) three generic levels of subculture, that of the operator, the designer, and the executive so this will be an important aspect in this research.

2.11 High Reliability Organisations

There are two main competing theories relating to organisational accidents which are: high reliability theory, and normal accidents theory. High reliability theory of organisations takes the rational view that with the intelligent design of systems and effective management, accidents can be avoided (Sagan, 1993). This theory is associated with those organisations operating hazardous technologies but the principles are applicable to other organisations (Antonsen, 2009c). Sagan identifies the following critical factors associated with this theory: redundancy of systems; decentralisation of decision-making; a culture of reliability; continuous operations; and frequent, realistic training; organisational learning from incidents; and leadership provided by a champion at the highest level to promote a safety culture within the organisation. Weick and Sutcliffe (2001) identify five processes that explain why high reliability organisations manage adverse or unexpected events better than other organisations. These processes are the preoccupation with failures rather than successes; reluctance to simplify interpretations; sensitivity to operations (related to Reason's concept of 'latent failures' discussed in a later section); commitment to resilience; and deference to expertise rather than authority. These are enabled by the presence of a fluid decision-making system. What emerges from these five processes is a state of mindfulness that Weick and Sutcliffe (2001, in the executive summary) describe as having "a rich awareness of discriminatory detail and an enhanced ability to discover and correct errors that could escalate into a crisis". They emphasise that reliability is not ensured by removing variation from a system as they believe a system with variety and the ability to adapt will ensure stable high performance. It is the drive to act 'mindfully'[1] and to put in place structures and processes that enables an organisation to identify unexpected events arising, halt their development or to contain it, and to build organisational resilience and its capability to restore its systems. The fundamentals of risk management, risk recognition, risk prioritisation, and the management of those risks, can be seen within this description. Weick and Sutcliffe (2001) identify the "key difference between a high reliability organisation and one that isn't is that the latter will react to weak indications of an event occurring with a weak response." It is the high reliability organisation that will interpret the signals as being significant and will make a strong response to those weak signals. Levenson

[1] Langer (2014) informs us that mindfulness is the ability to create new categories which we use to label, and re-label, the world around us; an openness to receiving new information; and being aware that there many perspectives in play, all of which affects our behaviour.

(2011) takes an alternative view to that traditionally held of high reliability organisations. She informs us that the assumption of continually increasing system, or component, reliability is widely supported in engineering as well as other fields. However, this assumption ignores the fact that reliability and safety, as an outcome of a 'high reliability organisation', are not the same and that they have different properties. A system can be safe yet unreliable, or unsafe but reliable. They can also conflict in that attempts to optimise either reliability or safety may result in deterioration in the other and instead becomes a process of sub-optimisation.

Normal accidents

Perrow (1999) introduces us to the theory of normal accidents, an alternative and competing theory to the high reliability theory. In normal accidents theory major accidents, although they may be rare, are an integral characteristic of organisational systems. This theory is based on the levels of complexity within an organisation's systems that can confuse organisational employees, and tight coupling within those systems that can inhibit a timely recovery being made following an incident. The theory of normal accidents predominantly focusses on the organisation and its systems but pays little attention to the contributions of the organisation's employees to these accidents.

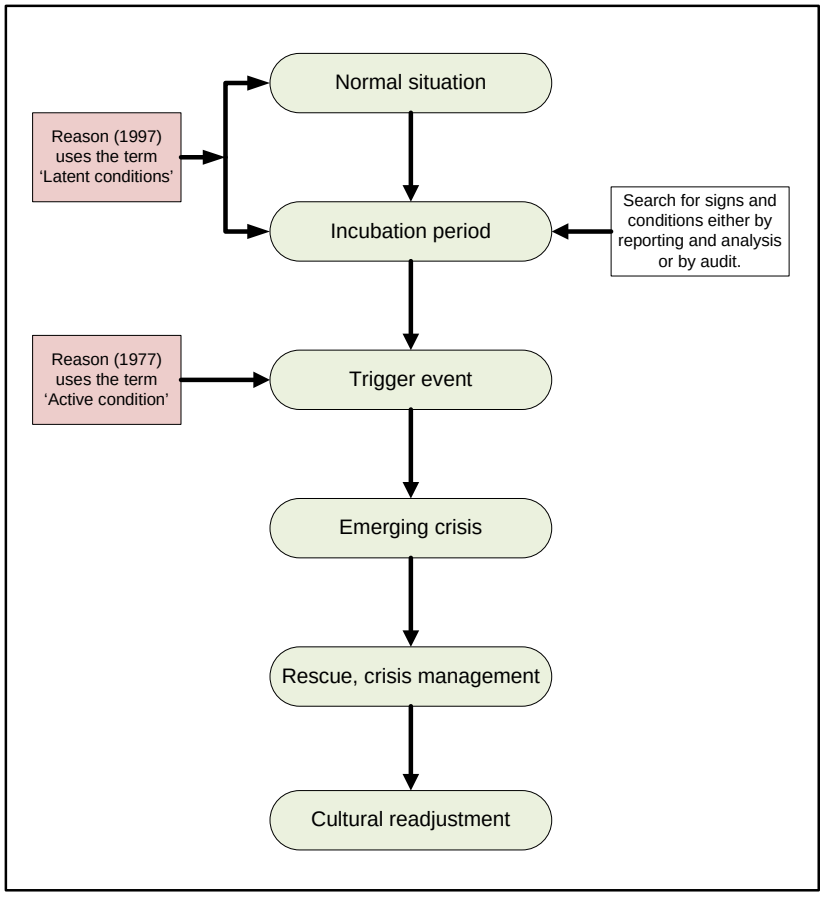
2.12 Human factors

In their review of analyses of industrial accidents Flin et al. (2008, p1) reported that up to 80% of accident causes can be attributed to human factors (Wagenaar and Groeneweg, 1987 cited in Flin et al., 2008; Reason, 1990; Helmreich, 2000). Of the eleven accidents Flin et al. included in their research they determined the most common failures involved decision-making, leadership, situational awareness, and communications.

We can classify an organisation's processes into two categories, those associated with production and those with protection (Reason, 1997). All organisations produce an output or outcome and productive systems require other systems to protect the organisation, staff, and assets from its operational hazards. Poor supervision, system design, procedures, and inadequate training will affect an organisation's operational systems creating the environment in which an accident can occur. Reason (1997) categorises these factors as 'latent conditions', sometimes referred to as 'latent failures' (Antonsen, 2009c). Reason

(1990) uses the 'Swiss-Cheese' model to demonstrate how a series of protective systems, each with their own intrinsic weaknesses, may become aligned due to local circumstances and through which an active failure can breach the defensive processes of the system enabling an accident to occur. However, Antonsen (2009c, p14) believes that Turner's model of man-made disaster (see Figure 2-4), an alternative to the Swiss-Cheese model, has not received its due recognition in empirical research into safety culture for what he believes is a powerful model in how it conceptualises "the relationship between culture and safety" and provides a better fit in explaining how an accident occurs. Turner's model acknowledges that there is an 'incubation period' during which procedures are repeatedly violated providing signs and symptoms of an impending incident or accident.

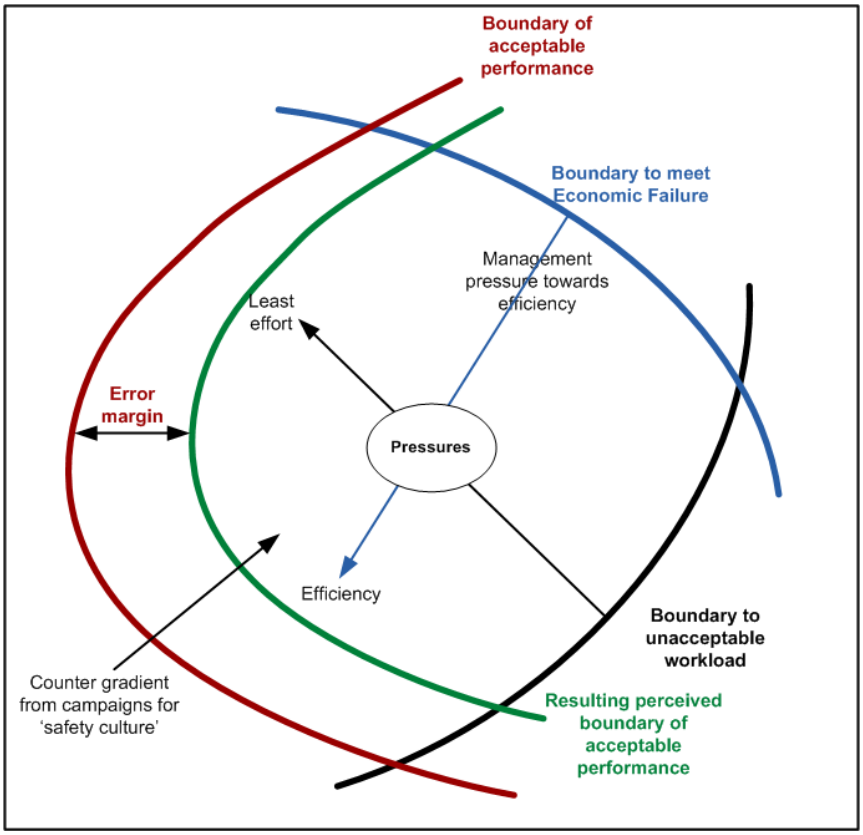
Figure 2-4. Turner's man-made disasters model.



Based on Johnson et al. (2008)

Rasmussen (1997) produced a 'drift into danger' model, which is shown in Figure 2-5 in which he informs us that the different actors, predominantly management and the workforce, exert their own pressures with the workforce seeking to reduce pressures that would increase the effort required whilst the management seek greater efficiency. These two pressures can overlap and in tandem will push towards the boundary of acceptable performance which acts as a safety boundary. The boundary of acceptable performance is changeable reflecting changes to systems, particularly protective systems; it may not always be well defined; and the pressures may change over time. This model captures Dekker's (2011b) concept of 'drift into failure'.

Figure 2-5. Rasmussen's model of 'Drift into danger'.

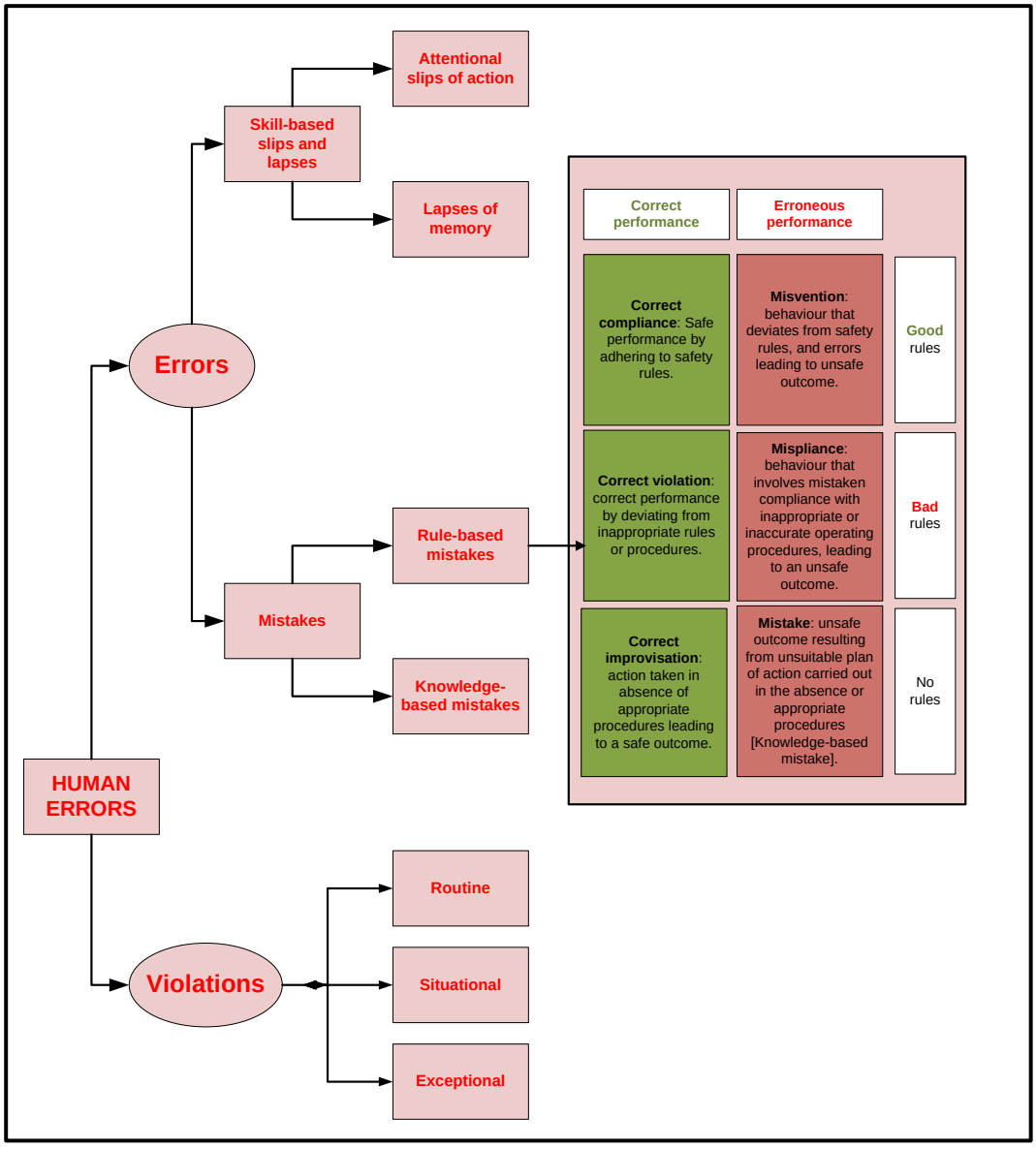


Source: Rasmussen (1997)

Reason (1997) uses the term 'active failures' to refer to the human errors and violations committed by actors working within operational systems. Active failures act as the catalyst for an accident within an operational environment laden with latent failures, usually of a systemic nature. These active failures can relate to skills-based, rule-based, or knowledge-

based performance (Reason 1990, 1997). One cause of these active failures by human actors is their perception of risk, particularly in regard to their familiarity with the task in hand (Douglas, 1985). Figure 2-6 identifies the principal error types with an emphasis on rule-based performance (Reason, 1997; Health and Safety Executive, 1999). In this Figure Reason's routine violations would equate to Dekker's (2011b; 2012) 'drift into failure'; situational violations relate to taking into account the reality of the situation with which one is faced, and is reliant on situational awareness; and exceptional violations due to unlikely or unforeseen events.

Figure 2-6. Summary of human errors and violations.



Source: Reason (1997) and Health and Safety Executive (1999).

Reason points out that there is one further unsafe action to Figure 2-6, which he relates to an action that has previously proved successful, but violates good rules, and was based on a faulty hazard assessment. He points out that this type of action is not a 'Correct violation' but one which can lead to future 'Misventions' based on learned behaviour, resulting in overconfidence and consistent underestimation of hazards.

Managers and supervisors have to make decisions about 'production' systems every day that involve a choice being made between production, its cost-effectiveness, and safety (Reason, 1997; Levenson, 2011). Changes, or adaptions, in safety systems seen as optimisation with the intent of increasing cost-effectiveness are examples of how organisations may instigate a drift towards failure (Dekker, 2011b). System changes may have no immediate observable effect, and although any new and unwanted behaviour may appear to be the result of negligence or complacency, it may in fact represent what has become the new standard across the system or the organisation (Dekker, 2006). As well as being a potential hazard it can be the decisions and actions of the individual, as the hero of the moment, that prevents an accident occurring (Reason, 2008).

How an organisation perceives and reacts to risk, and its signs and symptoms, is dependent on the organisation's safety culture (Turner, 1978; Reason, 1997; Woods et al., 2010) which is categorised as being either pathological, bureaucratic, or generative (Reason, 1997; Woods et al., 2010). The first two categories of pathological and bureaucratic can lead to the development, or incubation, of the latent conditions that Reason (1997) and Turner (1978) identified. A generative culture is one in which an organisation will use the available information to improve its systems and performance.

2.12.1 Leadership, Commanders and Managers

When an individual is in a position to influence how the values of others are shaped, Schein (2010) uses the term 'leadership' to describe this behaviour. It is the creation, management, and maintenance of culture that are the basis of leadership. Schein refers to leadership and culture as being two sides of the same coin. Much of the research on the relationship between leadership and culture has been focussed on the leadership exercised by an organisation's founder, or at corporate level. However, there is also a role for

leadership in establishing or maintaining a culture at the lower levels of an organisation, particularly when small units operate in what is in effect a de-centralised structure.

When not training for, or attending incidents or conflicts, then in uniformed organisations the leadership style reflects the cold side of the organisation in that it is traditional, has the same formal disciplinary code, operates in a rational and linear manner using cognitive and analytic skills (Hunt and Philips, 1991, in Soeters, 2000, p423). It is during these 'cold' times the subculture is "dominated by boredom, perceptions of underutilisation, stimulus deprivation, and concerns for privacy… (*in which*) many negative experiences are expressed and internal conflicts are likely to occur" (Harris and Segal, 1985, in Soeters, 2000, p423). It is for this reason that Soeters (2000, P423) emphasises the importance of the role of the 'commander' in strengthening the unit's cohesion which he describes as "a prerequisite of the satisfactory performance of uniformed organisations not only under cold but certainly also under hot conditions". He proposes that the uniformed organisation's culture should include preparing individuals for the 'unthinkable' situations during the socialisation process and training regimes. This would also help to address the 'loss of fear' that can occur in both individuals and within groups. Hunt and Phillips (1991, in Soeters, 2000) inform us that as well as cognitive behaviour, and in exercising the authority of their position, the leader must also demonstrate the appropriate emotions such as courage, their control of fear, and compassion.

In his research of US firefighters, Fender (2003) concluded that a key contributory factor to firefighter deaths and injuries was the level of risks firefighters were willing to take, the level of supervisory control, and monitoring of risk taking. Whether firefighters were prepared to accept instructions was dependent on whether they trusted the incident commander's knowledge, experience, self-confidence, levelheadedness, judgement, and the level of mutual trust. Fender and Klein (2014) provide, as an example of a lack of trust in the 'incident commander's' knowledge, expertise and judgement the incident at Mann-Gulch in the USA. This was when 12 'smoke-jumper' firefighters and one forestry Ranger ignored the instructions of the foreman and subsequently died in a forest fire. Only the foreman and the one firefighter survived after he had ordered them to drop their tools, not to attempt to outrun the fire, and that he would pre-burn the immediate area in which they were to then lie down in. The 13 who died attempted to outrun the fire uphill on a grass covered ridge when the fire caught up to them. A contributory factor to why the Foreman's

instructions were ignored was found to be that the Foreman and the firefighters had not previously worked together operationally.

2.12.2 Decision-making

The first step in making a decision is to gain an understanding of the situation and its context. Flin et al. (2008) describes this process as situational awareness in which an assessment is made, and a mental picture is built using the available cues to explain the situation facing the decision maker. US fire departments use the term 'size-up' to describe the process of identifying the situation, the risks, and resource issues (Okray and Lubnau, 2004; Lubnau, 2006; Diehl, 2008; Bachman, 2009; Stiles, 2009). Klein (1998) adds to this process of decision making the identification of expectancies and the actions required.

The realist perspective to risk assumes that people can remain objective, bias-free and will act in a rational manner (Jaeger et al., 2001). It is this theory of rational action that forms the basis of the Rational Actor Paradigm (RAP) which assumes that individuals are free to make a choice between options, based on the likelihood of expected outcomes, matched to their preferences that will produce the optimal outcome. However, the RAP has been widely criticised and Jaeger et al. offer the following points as to why:

- The set of possible actions may not be well defined.
- Judgements of likelihood may differ from probability theory.
- Preference change in decision-making may be a normal and influential process.
- Because of limited time available, memory etc., decision makers may be unable to perform systematic comparisons between alternatives as required by the RAP.

A rational actor would be expected to use rational models of decision making such as subjective expected utility theory, multiattribute utilities theory, and Bayesian inference models (Cannon-Bowers and Salas, 1998), which have been successfully used in both civilian and military organisations for evaluating alternative system designs, allocation of financial resources, and the analysis of data. However, Cohen (1981) argues that the conditions for rationality are so loosely coupled that when taking into account an individual's motives and objectives for action then any decision made could be seen as

being outside the bounds of rational thinking. Cohen argues that rational thought is based on two kinds of competence.

- A universal competence in conducting logical operations.
- A culturally acquired competence in "recognising, assembling, and sorting particular elements".

The combination of the two forms of competence has been labelled as 'intuition' by Cohen. His view is that as it is impossible to determine how culture will affect the inputs into making a decision, then we cannot prove that decision to have been made irrationally.

A second category of decision theories involves the use of descriptive models more commonly referred to as heuristics and biases, where heuristics are simply using 'a rule of thumb', or common sense. Biases refer to deviations from what might be deemed as rational thinking (Cannon-Bowers and Salas, 1998). Simon (1955; 1956) introduced the concept of bounded rationality in which he determined that many people do not attempt to evaluate all of the available options and then seek to maximise the subjective expected utility, but instead only consider a small number of options until they discover the first that satisfies them. Simon describes this process as 'satisficing' (Collyer and Malecki, 1998).

In the 1980s, decision-making research moved from using college students as subjects to using professional experts from the industry being studied. Orasanu and Connolly (1993, in Cannon-Bowers and Salas, 1998, p23) believe this change related to the consensus that classical decision-making was not being applied by decision makers in many real-life situations. They believed research "did not take into account the expertise of the decision maker", or the need to quickly "reach a satisfactory solution to gain control of a problem …as opposed to try and reach an optimal or perfect solution" (Flin et al., 2008, p43). Of the critical decisions that we make Klein (2003) identified that 90% of them were made using our intuition, as opposed to analytical or rational decision-making. This development was critical to the research being conducted into decision-making in 'safety-critical work settings' (Flin et al., 2008) and has been labelled naturalistic decision-making (NDM). One of the foremost theoretical approaches to NDM is that of recognition-primed decision-making (RPD) in which decision-makers interpret a situation by comparing it with similar situations they have previously experienced, and then retained as mental models for future use.

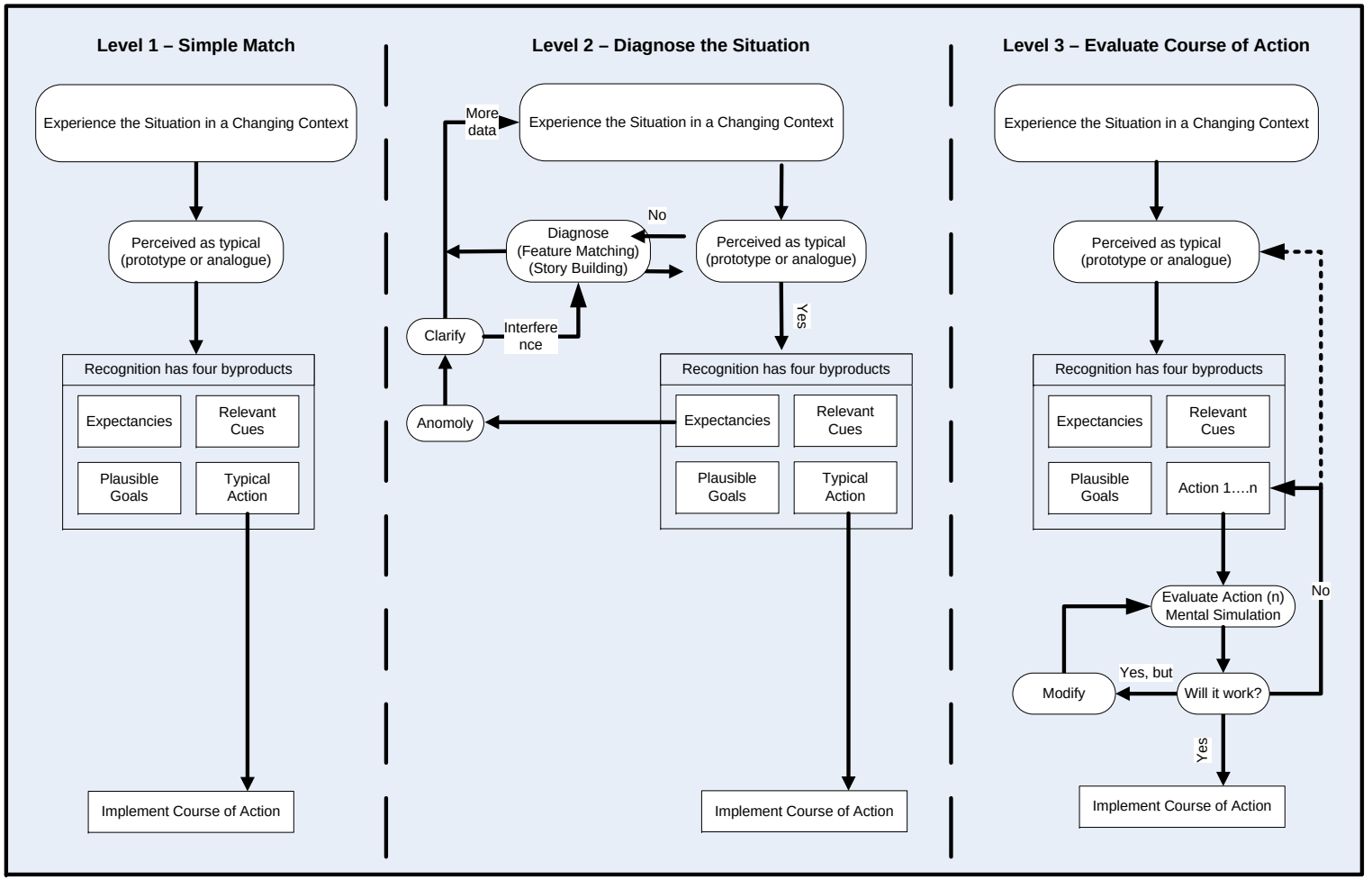
RPD allows a decision maker to take in the situation at a glance, and identify the key issues, but it operates at the subconscious level where the individual is reaching these decisions before the decision-maker is consciously aware of doing so. This process assists in explaining why subjects have been observed as not so much explaining why they made certain decisions but are attempting to justify those decisions when being called to account. It is this ability of experienced decision makers to make rapid decisions in the objective unconscious part of the brain that Gigerenzer and Goldstein (1993) like to term 'fast and frugal'.

There are three levels of RPD which are shown in Figure 2-7. Level 1 is the basic strategy in which the decision-maker recognises the situation as being familiar and proceeds to take action. Level 2 is when the decision maker has to diagnosis the situation as the cues may not sufficiently match, or may match multiple mental models. Level 3 explains how a single option may be evaluated by mentally simulating the likely sequence of events.

Klein (1998) informs us that the use of rational decision-making strategies will not ensure novices make good decisions, and studies have shown that it is not necessarily useful for the more experienced decision-makers. Janis and Mann (1977, in Klein, 1998) inform us that use of the RPD model is dominant in decision-making even when time is available to make comparative evaluations between options. One of the key points RPD researchers make is that the ability to recall previous incidents, and to make mental simulations, requires the decision-maker to be experienced in that type of incident; this is not a decision-making strategy for novices.

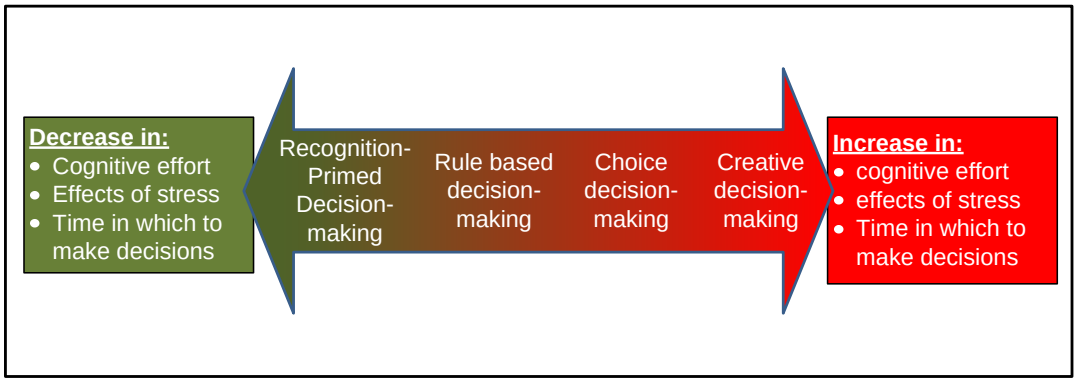
Stress has often been blamed for poor decision-making; however, Klein (1998) reminds us that individuals, e.g. fire ground commanders, nurses, and pilots perform well under extreme pressures such as time, high stakes, ambiguity, etc.. He believes that stress is not the cause of poor decision-making, but instead affects how we process information. Under time pressure the decision-maker is unable to sample from the available cues and gather the full range of information. Experienced decision-makers can adapt well to time pressure because they focus on the most relevant cues, whereas if they are using rational choice decision-making, research has shown they are more likely to be affected by stress. The selection of decision-making strategy and the effect of stress is shown in Figure 2-8.

Figure 2-7. The three levels of recognition-primed decision-making.



Source: Klein (1995, cited in Flin, 1996); (Klein, 1998)

Figure 2-8. Relative effects of stress on decision-making method selected.



Source: Flin et al. (2008) incorporating Hammond's Cognitive Continuum theory (in Dowie and Elstein, 1988).

2.12.3 Trust

An individual can place their trust in other individuals, teams, technology, and organisational systems (Virrantaus et al., 2009). This trust is based on the object of that trust meeting the perceptions and expectations of the individual, and their previous experience of them in an operational context. Blomqvist (2002; in Seppänen et al., 2013) points out that trust may be conditional and dependent on the task or role being undertaken, the situation and its context, and the level of competence being demonstrated by the individual or group. Seppänen identifies two types of trust; the first is 'traditional trust' which grows over time from shared experiences, a common history, shared values, predictable behaviour, and based on competence. The second type of trust was identified by Meyerson et al. (1995) as 'swift trust', which reflects the level of trust placed in individuals, groups, or systems that have come together in a temporary grouping and in which there has been no opportunity to previously build up a level of traditional trust. Gabriel (1985, p10) in looking at the relationship between troops and their officers, informs us that "The bonding of men in battle can occur only when subordinates see their officers as competent, trustworthy, and dependable leaders. These perceptions and attachments require long tours of duty with the same unit."

2.13 Risk culture and its relationship to safety culture

Following the near melt-down of the financial sector in the western world in 2008 the term 'risk culture' has gained increasing attention, figuring predominantly in documents and

references from regulators and market commentators. Ashby et al. (2012) identified in their research that the use of the term 'risk culture' had increased over the previous 10 year period particularly in the financial sector and that while culture has been widely written about, risk culture has been ignored and they cite the two academic papers they had discovered on this subject at that time, Bozeman and Kingsley (1998) and Power (2007). The term 'risk culture' first came into prominence in relation to the Piper Alpha disaster, although some of the previous work by Professor Barry Turner, e.g. Turner (1978) has been related to the field of 'risk culture' (Ashby et al., 2012). Much of Turner's subsequent work has been focussed on safety and safety culture. In various books, papers and articles reporting on major accidents the terms 'risk culture' and 'safety culture' are rarely found being used together, or an explanation provided as to the relationship between the two terms. Some articles including reference to major catastrophes either use the general term 'culture' or 'safety culture', but some authors have substituted 'risk culture' instead of the original term 'safety culture' used in the accident report following a catastrophe (e.g. Levy et al. (2010a) referring to the Columbia Accident Investigation Board (2003). This indicates that there is some ambiguity regarding the separation between the two concepts.

Pidgeon (1998, p202) informs us that from initially modelling organisational latent conditions, to identifying the potential hazards, both of which he describes as "the paradox of 'safety' culture", the focus of research has now moved to how this acquired knowledge can be used to construct a safer environment. He views the latent conditions and their potential hazards, and the 'safety' culture as being two sides of the same coin and emphasises: that they "must always be considered together, and the goal of all disaster and accident researchers is to move from one to the other". In this statement we can infer a move from operating in a 'risk culture' in which we identify the latent conditions and their hazards and then, by mitigating the risks, we move to operating in a 'safety culture'.

Antonsen (2009c, p7) offers his views on this relationship between the two concepts:

> "If the concept of risk is related to identifying dangers and estimating the likelihood of their occurrence, although this will never be an objective measure, the concept of safety refers to our ability to handle and control these dangers. Consequently, safety has to do with minimising risk. This underlines the complementarity of the concepts. It also points to the fact that the concept of safety refers to the measures taken to minimise risks, either by reducing the probability of a hazardous event occurring or by reducing the consequences of the event if it does."

Ashby et al. (2012, p6), the Institute of International Finance (2009), Roche (n.d.), and Levy et al. (2010b) inform us that risk culture has been defined inadequately and in many different ways. Levy et al. (2010, p2) inform us that it "is usually only spoken of narrowly. In the context of incentive and organisation structures" Table 2-6 identifies a sample of the available definitions of risk culture and their main themes. As with definitions of culture and safety culture there are the common themes of values, beliefs and attitudes. The definition I have used for this research is that of the Institute of Risk Management (2012, p7), risk culture is "a term describing the values, beliefs, knowledge and understanding about risk shared by a group of people with a common purpose, in particular the employees of an organisation or of teams or groups within an organisation."

The term 'risk culture' is not specific to the financial sector and as Ashby et al. (2012) observe the issues associated with risk culture has many similarities with other change initiatives including 'safety culture' in the oil and aviation industries. They associate risk culture with the need for "clarity about, and commitment to the enforcement of risk appetite or tolerance." The Institute of International Finance (2009) inform us that risk culture is about how an organisation lives within its risk appetite and manages its risks. Roche (undated, p1) informs us that:

> "Risk-based behaviours cover the attitudes, beliefs, decisions and actions of board members, executives and all staff. For instance individuals making decisions on strategy, programs or operations will need to understand the behavioural parameters and level of risk that is acceptable to the organisation."

One of the key themes in describing risk culture is the risk appetite, or risk tolerance, which provides a clear differentiation between safety culture and risk culture, of an organisation. The Institute of Risk Management (2011, p10) defines safety culture and risk culture as the level of risk "they wish to engage with (*risk appetite*)" and "the level of risk they might just be able to put up with (*risk tolerance*)". Bozeman and Kingsley (1998) inform us that the level of risk being tolerated within a 'risk culture' is related to the level of trust managers hold in their employees and the clarity of the organisation's mission, goals, and objectives. They found that organisations that were more bureaucratic; had a lack of meritocracy in regard to promotions; and were subject to political control tended to be more risk averse.

Table 2-6. Example definitions of risk culture.

Source	Risk culture definition	Focus on
McKinsey (2010)	The norms of behaviour for individuals and groups within an organisation that determine the collective ability to identify and understand, openly discuss and act on the organisation's current and future risks.	•Behaviour •Communications
KPMG (2010)	The system of values and behaviours present throughout an organisation that shaped risk decisions. Risk culture influences the decisions of management and employees, even if they are not consciously weighing risks and benefits.	•Behaviour
Towers Watson (2011)	the norms and traditions of behaviour of individuals and groups within an organisation that determine the way in which they identify, understand, discuss and act on the risks the organisation confronts and takes.	•Values •Behaviour
PricewaterhouseCoopers (2009)	Organisational behaviours and processes that enable the identification, assessment and management of risks relative to objectives ranging from compliance to operational, financial and strategic.	•Behaviours •Governance
Standard and Poor	Begins with fostering open dialogue where every employee in the organisation has some level of ownership of the organisation's risks, can readily identify the broader impacts of local decisions, and is rewarded for identifying outside risks to senior levels. In such cultures, strategic decision-making routinely includes a review of relevant risks and alternative strategies rather than a simple return-on-investment analysis.	•Communication •Empowerment •Expertise
Institute of International Finance (2009)	Risk culture can be defined as the norms and traditions of behaviour of individuals and of groups within an organisation that determine the way in which they identify, understand, discuss, and act on the risks the organisation confronts and the risks it takes - all employees be aware of what risk they are taking, make the right decisions and raise objections when necessary.	•Behaviour
The Committee of European Banking Supervisors	Risk culture is a state where every member of the organisation must be constantly aware of his responsibilities relating to the identification and reporting of risks and other roles within the organisation and the associated responsibilities to these roles.	•Individual responsibilities
Risk Management Associations Enterprise Risk Counsel	Risk culture is a set of shared values and beliefs that governs attitudes toward risk-taking, care, and integrity, and which determines how openly risks and losses are reported and discussed.	•Behaviour
Oxford Risk Research	Risk culture is the social and organisational determinants of individual risky decisions.	Open to interpretation
Basil Committee (2011	The combined set of individual and corporate values, attitudes, competencies and behaviour they determine a firm's commitment to and style of operational risk management.	•Attitudes •Behaviour •Competences
Financial Services Authority (2006)	The general awareness, attitude and behaviour of its employees and appointed representatives to risk and the management of risk within the organisation.	•Attitudes •Behaviour
Institute of Risk Management (2012)	The values, beliefs, knowledge and understanding about risk shared by a group of people with a common purpose, in particular the employees of an organisation or of teams or groups within an organisation.	•Values •Beliefs •Knowledge
Bozeman and Kingsley (1998)	The organisation's propensity to take risks as perceived by the managers in the organisation.	•Risk setting
O'Donovan (2011)	A risk culture is based on particular beliefs and assumptions. These can be clustered according to specific cultural tenets, namely risk, integrity, governance and leadership, decision-making, empowerment, teamwork, responsibility and adaptability... These tools are expressed in everyday workplace practices the attitudes and behaviours and, when there are expressed by leaders, they serve as powerful (human) culture and bedding mechanisms.	•Beliefs •Assumptions •Attitudes •Behaviour

Source: Ashby et al. (2012); and Banks (2012).

2.14 Summary of the literature review

What the researcher has identified from this literature review is that there remains an on-going philosophical debate amongst academics regarding how culture and climate should be defined with varied descriptions of the differences between them, including their intellectual heritages and their associated methodologies. What was of interest to the researcher was that, unlike culture, climate is perceived as being difficult to measure, and that there is a growing trend within academic research to use a combination of the two concepts. The literature review has shown the importance of the organisational research conducted by Soeters (2000), who appears to take a more pragmatic approach to the use of organisational culture, in that he identified an organisation, such as the FRS, as having both a 'cold' side and a 'hot' side to it. The cold side can be successfully influenced by the organisational safety culture, reflecting the organisation's level of risk tolerance in controlling the working environment having identified all the hazards and uncertainties; the probabilities of occurrence modelled, and then the risks being managed via all-encompassing semi-permanent structures, processes, and rules established by management to ensure compliance by the workforce to ensure their safety, the safety of others, the environment, and equipment. This is in direct contrast to the hot side of the organisation that reacts to temporary situations or events, often dynamic in their nature, with high levels of risk and uncertainty, with time constraints being applied, by appointing a leader to implement ad-hoc or adapted structures and procedures dependent on the situation. Zhang et al. (2002) use these two different work environments, reflected in the hot and cold sides of an organisation, to relate to the use of the terms climate and culture. This is where the hot side of the organisation adopts a temporal and situational risk-based climate at a specific event or incident, in which all the risks may not yet have been identified, is laden with uncertainties that require temporary structures and processes to resolve the incident. Whilst operating in a risk climate the level of risk appetite adopted will vary being dependent on the hazards identified, the risks assessed, and whether risk mitigation strategies are in place. It is at this point the risk climate then becomes a safety climate in which the safety of staff, other people, and equipment in regard to the risk exposure is kept as low as is reasonably practicable (ALARP) in order to resolve the incident. It is this adoption of a risk climate and gradual movement to a safety climate that this researcher has labelled the operational culture specific to the English FRS. A definition of operational culture, in the context of the FRS, is provided in section 7.6.

Antonsen (2009c) views safety and risk as being two different concepts with the former involving the identification of risks and the likelihood of them materialising whilst safety is to do with minimising those risks by controlling them. Both these concepts effectively constitute the component parts of a risk management strategy. Antonsen's use of the two concepts fit well with the relationship between risk climate and the concept of risk; and safety climate and his concept of safety. The two concepts also fit well with the concepts of there being a hot and a cold side to an organisation in that the cold side of an organisation operates within the concept of safety utilising objective probabilities, whereas the hot side of the organisation operates within the concept of risk using subjective likelihoods and the estimation of consequences to assess risks. It is for this reason that although the hot side of an organisation, having moved from operating in a risk climate to a safety climate, there still remains sufficient risk and uncertainty to categorise the organisation as operating under the concept of risk rather than the concept of safety.

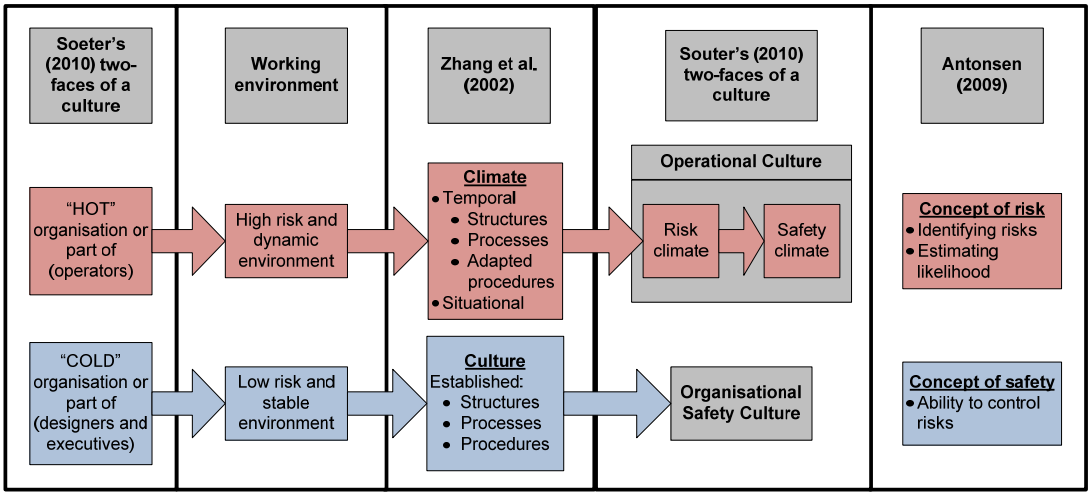
The influence of human factors and in particular decision-making, leadership, situational awareness, and communication have been identified as the most common contributory factors in previous industrial accidents (Flin et al., 2008). Latent conditions and their incubation period contribute to a 'drift into danger' (Rasmussen, 1997), or a 'drift into failure' (Dekker, 2011b), that provides the environment in which an accident can occur are often associated with factors such as poor supervision, system design, procedures, and inadequate training. Decision-making has been the subject of much research in the past with a previous focus on the role of rational decision-making. Simon (1955; 1956) moved the discussion onto what he called 'bounded rationality' in which not all potential options are considered or evaluated, a process which he described as 'satisficing'. (Orasanu and Connolly, 1993; in Cannon-Bowers and Salas, 1998) believed that previous research did not take into account the expertise of the individual making the decision and this view contributed to the introduction of naturalistic decision-making and then recognition-primed decision-making. Leadership is a factor that is dependent on the level of trust between officers and their subordinates and can only be developed by working with each other to build that bond of trust through shared experiences.

Risk culture is a relatively new area of research having previously seemingly been ignored when compared research in other fields of culture. The terms safety culture and risk culture have been used by academics and practitioners interchangeably. Pidgeon (1998) views

them as being two sides of the same coin and that the goal of accident researchers is to move from one to the other. Key to the concept of risk culture is the risk appetite and risk tolerance of an organisation and its staff. The former relates to the upside of risk in that the risk appetite identifies the level of risk we are prepared to accept to achieve the objectives which is associated with risk culture: whereas risk tolerance relates to the level of risk we are prepared to expose ourselves as part of our safety culture.

This relationship between culture, climate, 'hot' and 'cold' sides of an organisation, and risk and safety, based on the literature review was confirmed by the key informants as capturing what they would describe as the safety culture of the FRS at operational incidents. This is shown graphically in the model shown in Figure 2-9.

Figure 2-9. Relationship between culture and climate, risk and safety in uniformed organisations.



This model was used to guide both the focus for the intended data collection via interviews, focus groups, a questionnaire, document review, observations, and their subsequent analysis to identify if this model was being used, either formally or informally, within those FRSs that were participating in the research. Did FRSs and their personnel differentiate between hot and cold sides of their FRS and was this reflected in their policies, procedures, and training? Of particular interest to the researcher was the identification of trends across the role groups of executive, designers, and operators in relation to their respective working environments and any arising differences between the groups. The interviews and focus groups would be used to identify whether operational staff across the role groups identified with, and thought appropriate that incidents should be classed as temporary events, each different to one another within their more generic incident type

classifications. The researcher's intentions included identifying whether current procedures based on FRS policies accurately captured the reality of incidents or whether incident commanders were having to adapt the recognised structures and processes incorporated with FRS procedures to reflect what was actually occurring on the incident ground. A further area of interest was to investigate whether FRS personnel viewed the relationship between risk climate and safety climate, both being temporary states aimed at resolving an incident and bringing it to a successful and safe resolution, was reflected in the reality of their operational experience. Did FRS personnel identify with the concept of there being both a safety culture and a risk climate operating in tandem then in what way did the safety culture contribute to operations on the incident ground and was safety culture seen as a constraint or an enabler? Key to conducting successful operations is the relationship between the incident commander and the firefighters and the level of trust built between them both from the shared learning from attending operational incidents together and during training. This level of mutual trust would be based on the incident commander's decision-making abilities, including risk management, their level of risk appetite and tolerance each affected by their own individual experiences. Equally, the incident commander's perception of the competence of their subordinates would be affected based on those previous experiences which may affect the incident commander's risk appetite at an incident.

In regard to the incident commander the literature review raised a question as to what the role of the incident commander is at an operational incident: was it that of a manager who utilises and operates within the FRS's established systems and their processes including operational procedures? Alternatively, does the role of the incident commander require a leader able to adapt and compensate, and take on the responsibilities for decisions made at those incidents that did not conform to the situations envisaged when operational notes were first published?

Chapter 3 Research Methodology

"Research is a systematic process of collecting, analysing, and interpreting information in order to increase our understanding of the phenomenon about which we are concerned" (Leedy and Ormrod, 2005, p2). This chapter selects the appropriate approach, strategy, design and methods with which to conduct this research into safety culture in the English Fire and Rescue Services.

3.1 The researcher

The researcher is a retired FRS officer whose career was predominantly operational, but also included training, providing an operational assurance/audit function in two fire and rescue services, and audit at the national level with Her Majesty's Fire Service Inspectorate. This close association with the FRS might be viewed negatively in that the researcher will come into this research with his own biases based on his previous experiences, a point recognised by Silverman (2000). However, he also acknowledges that it is this experience that provides the researcher with the subjective knowledge to understand the formal and informal structures, cultures and sub-cultures, the political influences, and the lay language of the participants. It is this familiarity with the FRS that allows a rapport to be built quickly with FRS personnel and to identify areas that would require additional information or confirmation. The FRS has been acknowledged by previous researchers to be laden with the use of acronyms and abbreviations being used in every day conversation that can make it difficult to understand what is being said or referred to. Having been a member of the FRS has also provided the researcher with the contacts who are in a position to act as gatekeepers and key informants. Experience as an operational and operational assurance officer provides the operational knowledge with which to subjectively judge firefighting decisions made during the particular circumstances of an incident, the resulting actions, and to discuss them at a later date with the personnel involved. Silverman (1997, p105) acknowledges these benefits when he informs us that it has been argued that researchers should be members of the groups studied so as to "have the subjective knowledge necessary to truly understand their life experiences."

3.2 Approaches to research

Creswell (2003) identifies three approaches to conducting research. The first two are quantitative and qualitative, and the choice of which would often be dependent on the school of thought: whether a scientific approach should be adopted (the human sciences associated with a quantitative approach), or that of an interpretative approach (the social sciences associated with a qualitative approach). Robson (2010, p131) identifies two types of research design, the fixed design which focuses on quantitative approaches; and the flexible design which is predominantly a qualitative approach but which may incorporate quantitative methods of data collection and will tend to "emerge and develop during the data collection". Creswell (2003) describes a third approach to conducting research based on a combination of both qualitative and quantitative methods which he labels a mixed approach. Creswell informs us that a mixed approach is now more commonly adopted than the singular use of either the quantitative or qualitative approaches. This research takes a mixed approach and will utilise both quantitative and qualitative approaches.

Creswell (2003, p5) utilises Crotty's (1998) model in identifying the three questions, or elements, he considers essential in considering research design:

- What knowledge claims are being made by the researcher (including a theoretical perspective)?
- What strategies of enquiry will inform the procedures?
- What methods of data collection and analysis will be used?

3.2.1 Research Strategies

The research strategy is inductive, associated with exploring and describing, and which Martin (2002) informs us is ideally suited for conducting cultural research. Yin (2003) and Platt (1976) also advocate the use of inductive logic and the identification of patterns to provide a model of explanation when theory testing using case studies as opposed to the use of deductive logic. Blaikie (1993, p132) identifies inductive research as being a "generalisation drawn from a series of premises" consisting of a series of statements referring to "specific instances of some event or state of affairs" and from which a general conclusion can be made, providing a general or universal statement. Blaikie (1993) informs us that following an inductive strategy "the conclusion makes claims that exceed what is

contained in the premises; it promises to extend knowledge by going beyond actual experience." DePoy and Gitlin (1998) view induction as being used to uncover or reveal theory, rules, and processes where it moves from a specific case to a broader generalisation about the phenomena being studied. Robson (2010) simplifies his description of induction as being a research strategy that starts with data collection from which theoretical ideas and concepts emerge.

Harré and Secord (1972; in Blaikie, 2009) identify three principles with the use of an inductive strategy. The first is that of accumulation in which scientific knowledge is built upon new facts confirming previously attested facts. The second principle is of induction in which laws are based on an accumulation of statements that describe a series of observations and that these facts lead to the inference of true laws. The final principle is of 'instance confirmation' relating the degree of our belief in a law is dependent on the number of observations made of the specific phenomena.

The inductive strategy consists of four stages (Wolfe, 1924; Hempel, 1966; in Blaikie, 1993). These are:

- All facts are observed and recorded without selection or guesses as to the relative importance.
- These facts are analysed, compared and classified, without using hypotheses.
- From this analysis, generalisations are inductively drawn as the relations between them.
- These generalisations are subjected to further testing.

Medewar (1969; in Blaikie, 1993, p137) summarises the inductive strategy in the following way:

> "Let us first assemble the data; let us by observation and by making experiments compile the true record of the state of nature, taking care that our vision is not corrupted by preconceived ideas; then inductive reasoning can go to work and reveal laws and principles and necessary connections."

In this way, Blaikie (1993) informs us that generalisations arising from the use of the inductive strategy can be defended as they will be based on facts derived by the use of objective and logical processes.

By adopting an inductive strategy Blaikie (2009) informs us that the associated ontology is that of the depth realist in which reality can be found to exist across three domains: the empirical domain in which observations can be made; the actual domain reflecting what actually exists and is independent of the observer; and lastly, the real domain consisting of the formal and informal structures and processes that may have to be uncovered during the course of the research. These three domains add a level of stratification that provides an ontological depth to the research. However, Blaikie does remind us that social structures tend to be susceptible to change over time and subject to significant events; are affected by the processes being undertaken; subject to the actions of the people that engage in those processes; and the perception of individuals in regard to their role in those processes. By adopting the ontology of the realist, the mixed methods approach is usually selected (Talbot, 2010), which usually involves multiple qualitative and quantitative methods to gain a deeper understanding of what are usually complex phenomena in human systems research.

The epistemology for this research is that of neo-realism in which knowledge is derived from the causes attributed to observed regularities associated with the structures and processes that produce them. To identify the structures and processes in which these regularities occur may require the researcher to conduct in-depth research beyond that which is readily observable. This may require the researcher to postulate or select which structures and processes to focus on. Blaikie (2009) informs us that this perspective on causation that allows for "competing or cancelling mechanisms" to be operating, even in those circumstances where no single event or series of events, or change has been observed.

The research paradigm adopted for use in this research is that of Interpretivism, and specifically in the form of a cultural study, in which social reality is seen as the product of the social participants who interpret the meanings of their everyday environment in regard to the social actions they undertake. Blaikie (2009, p36) informs us that studying social phenomena requires:

> "an understanding of the social world which people have constructed in which they reproduce through their continuing activities… People are constantly involved in interpreting their world-social situations, other people's behaviour, their own behaviour, and natural and humanly created objects. They develop meanings for their activities together, and they have ideas about what is relevant for making sense of these

activities. In short, the social world is already interpreted before the social scientist arrives."

Blaikie (2009) advises us that a research paradigm may incorporate more than one set of ontological and epistemological assumptions, which tends to make social research broader in its scope and less clearly defined than for research strategies. Of the two he focuses on the research strategy as being more essential than that of the research paradigm.

3.2.2 Strategy of Inquiry

The strategy of inquiry adopted for this research is that of a case study, one of the three recognised research designs for use in a flexible/mixed approach to research (Robson, 2010).

In defining a case study both Robson (2010) and Blaikie (2009) refer to the definition made by Yin (2003; 2011) which is also repeated in his later work, Yin (2014) :

A case study is an empirical inquiry that:

- investigates a contemporary phenomenon (the "case") in depth and within its real-world context, especially when,
- the boundaries between phenomenon and context are not clearly evident.

A case study inquiry:

- copes with the technically distinctive situation in which there will be many more variables of interest than data points, and as one result,
- relies on multiple sources of evidence, with data needing to converge in a triangulating fashion, and as another result,
- benefits from the prior development of the theoretical propositions to guide data collection and analysis.

Source: Yin (2014, p 16-17)

Within the literature on research design and methodology the terms 'variable' and 'item' are often used interchangeably to describe each question, or statement, that form part of a survey questionnaire. For the purpose of consistency the term 'variable' will be used in the

context of analysing the research instruments and the term 'item' to refer to those questions or statements which make up the research instrument.

Robson (2011, p136) acknowledges the contribution Yin (1994; 2003; 2014) has made to case study research becoming widely accepted within social research and the recognition that case studies can be utilised for many different motives ranging from "a simple representation of individual cases or the desire to arrive at broad generalizations based on case study evidence" (Yin, 2003, p15). Robson (2011, p136) emphasises some important considerations regarding the use of case studies that the researcher should bear in mind:

> A case study is:
>
> - A strategy or approach and not a method.
> - Concerned with research in its broader sense.
> - Empirical as it is dependent on the evidence collected
> - Particular to the case being studied.
> - Focussed on the phenomena and in particular its context.
> - Reliant on the use of multiple methods of data collection.

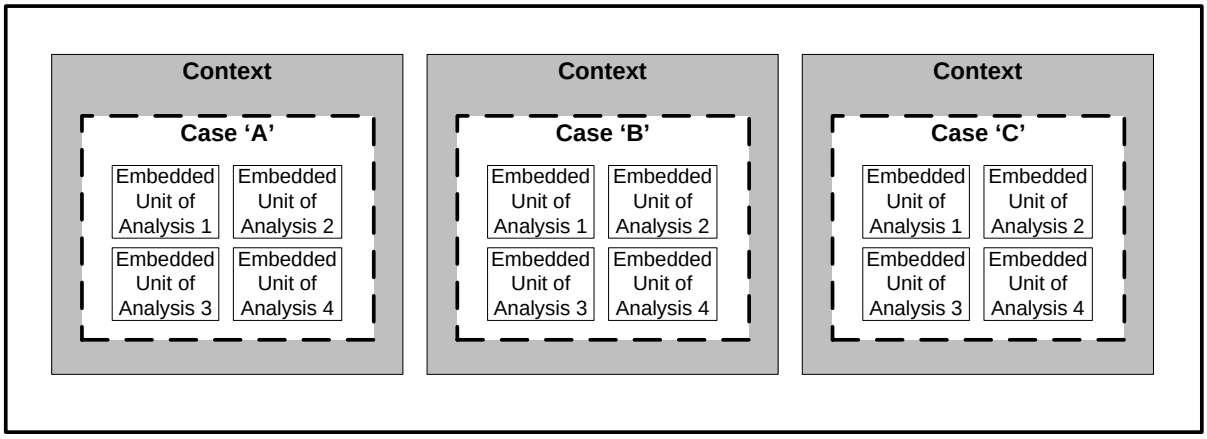
What is clear in the use of a case study is the importance of the context, or the situation, in which the case is situated, whether to explore, describe, or explain a particular phenomenon, Robson (2011), Yin (2003, 2009), and Blaikie (2009). Mitchell (1983; in Blaikie, 2009, p196) informs us "that detailed knowledge of the context is an important element in the researcher's capacity to draw conclusions from a case study". Platt (1988; in Blaikie, 2009) uses the word 'context', not just the environment in which the cases are situated to include the relevant academic knowledge and appropriate theory available at that time.

The inclusion of both quantitative and qualitative methods for data collection, as part of a case study, is acknowledged by Robson (2011) and Yin (2003, 2009, 2014). However, Robson suggests that it is rare to find quantitative methods having anything other than a minor role in what he believes is better categorised as being a flexible design as opposed to the use of a multi-strategy design.

Case study design

The design of the case study for this research is based on a multiple case study, or a collective case study using the terminology of Denzin and Lincoln (1998), consisting of embedded sub cases Yin (2003, 2009, 2011, 2014), see Figure 3-1. Cases for a multiple-case study are chosen in the belief that gaining an understanding of each of the individual cases will provide a better understanding of the population of cases (Denzin and Lincoln, 1998). The data provided by a multiple case design provides a range of data that provides a greater level of confidence, certainty, and credibility in the research findings. When cases are drawn from different sites the design will strengthen the decision to generalise from the results (Blaikie, 2009). However, a multiple-case design is more difficult to complete than a single case study requiring additional resources, particularly time, in which to capture and analyse the resulting data. There is a further issue regarding the level of in-depth research, normally associated with case studies, being sacrificed for a broader approach using more cases. Yin (2009) highlights that a single-case design may be criticised regarding any bias in the selection of the case to be studied affecting the data collection, its analysis, and subsequent conclusions. Each of the cases in this research is based on one of the three types of FRS to be found within England. Additional information on the types of FRA, and hence the type of FRS, is included within Section 4.1.2.

Figure 3-1 Example of an embedded multiple-case design for a case study.



Source: Based on Yin (2014).

This research commenced with the use of a descriptive case study which incorporates what Yin (2012, p238) identifies as an ordinary, or a typical case "whose purpose is to describe a

phenomenon (the 'case') in its real-world context", utilising a cross-case synthesis between the cases. With regard to using the results for generalising the concept Blaikie (2009) cautions us that it is sometimes difficult to justify a case as being typical, as opposed to it being unique, but the results can prove useful. Blaikie refers to Gomm et al. (2000) who have suggested that instead of using a single, typical case the wider population should be reflected in a multiple-case study when collecting data, allowing generalisations to be made using judgements based on the larger, target population. There is an alternative perspective on using typical cases which is proposed by Eckstein (1975), Mitchell (1983), Platt (1988), and Yin (2003, in Blaikie, 2009) who suggest that outlying, or extreme, cases should be used in theory testing. In these circumstances if a general theoretical principle proves to be robust it adds credibility to any generalisations being made.

Use of theory and concepts

Yin (2011) informs us that the theoretical concept and its dimensions will influence the design and analysis of the collected data when used with exploratory, descriptive, or explanatory case studies, particularly in regard to selecting the appropriate literature to be reviewed thus ensuring a contribution to the body of knowledge in that research area.

The theoretical perspective taken in this research is based on safety culture which has been outlined in the literature review. It forms the basis of the work of the Health and Safety Executive and is used to judge the FRS following accidents to, or fatalities of, either FRS personnel or persons they are responsible for; and is included in the Safe Firefighter Concept adopted by the FRSs in the United Kingdom. Yin (2011, p27) highlights other advantages of identifying a theoretical concept at an early stage in its contribution to defining the research case and the criteria by which cases should be selected; and most importantly in this research, identifying "the relevant topics of interest and, therefore, possible data to be collected". However, Yin (2011) informs us that we may need at some stage to realign the case study should the initial data collection indicate the theoretical perspective and concept provide ill-fitting models in which case they should be discarded and replaced.

Having selected the theoretical concept of safety culture to focus this research the intention is to use the dimensions associated with this concept to identify the topic of the questions to ask respondents. Wilson (2005) suggests that a researcher might consider

using a previously validated and reliable questionnaire, or to adapt some of the statements or questions from them. A number of safety culture questionnaires have been developed for use in different industries predominantly in the gas and oil industry (Flin et al., 1998; Antonsen, 2009c); the airline industry for both flight crews and maintenance staff (von Thaden et al., 2004; 2008a; 2008b); whilst the Health and Safety Laboratories (Health and Safety Commission, 1997) have developed a generic safety culture questionnaire. These questionnaires use different dimensions for the concept of safety culture making it difficult to allow comparisons to be made across the range of different industries and occupations. The generic questionnaire developed by the Health and Safety Laboratories (HSL) was previously used by Pessemier (2010) to study safety culture in the US Fire Service. HSL agreed to the use of its questionnaire for this research on the proviso that the data collected would be made available to the HSL. As a pilot study, the HSL safety culture questionnaire was taken to two watches and two senior officers, in UK FRSs in their role as key informants and who had not been selected to participate in this research as a subject. They were asked for their comments and observations regarding the items used and their suitability for use in research into safety culture in the English FRS. The general consensus was that they believed many of the questions did not relate to the operational work of the FRS. Some indicated that it was only the presence of the researcher that motivated them to complete the questionnaire. From this feedback it was decided that a questionnaire specific to the English FRSs would have to be developed and piloted before being distributed to the participating FRSs.

Generalising and theorising

Blaikie (2009) identifies two issues that have previously been the subject of discussion in regard to the use of case studies. The first is in regard to the generalising of findings, and the second is to do with the use of case studies to develop or test theories. In regard to generalising, Blaikie informs us that generalising from the results of case studies will always require a form of judgement being made rather than being based on the use of probability sampling techniques.

Other methods of generalising include 'natural generalisation', and 'analytic generalisation'. The former was suggested by Stake (1978; in Blaikie, 2009) in which he refers to natural generalisation, and it being used by people every day, in which we match similarities and

repeating patterns. Instead of the term ‘generalising’ Lincoln and Guba (1985; in Blaikie, 2009) use the term ‘transferability’ between cases if they are found to be similar. It is this ‘fittingness’ that reflects the ability to generalise from the context in which the research has been conducted and then transfer it to the context of another. For this generalisation to be accepted it is dependent on the researcher to provide sufficient detail on the context in both cases to allow others to make a reasoned judgement on the applicability of the generalisation.

The theoretical statement, theory, or the theoretical propositions, provides the basis for an analytic generalisation (Yin, 2014) in which accepted theory is used as a model with which to compare the empirical findings from a new case study or other situations (Yin, 2003, 2014). Eckstein (1975; 1992; both reported in Blaikie, 2009) proposed a five-way classification of case studies based on their contribution to theory ranging from the development of understanding, theory building, and theory testing. One of these classifications is that of ‘disciplined-comparative’, which is not used to build theory unless by way of a chance discovery during the course of the research. It consists of a process in which each case is compared in the context of that theory which has already been established in much the same way as used in ‘analytic generalisation’. As a cautionary note Yin (2014) advises that the researcher should seek to include analytic generalisations in case studies, a view that Blaikie (2009) also refers to. Lindesmith (1968; in Blaikie, 2009) uses the term ‘analytic induction’ to describe this process; whilst Yin (2014) identifies the following authors using different terminology: Mitchell (1983) uses the term ‘ logical inference’; Bromley (1986), ‘case inference’; and Donmoyer (1990), the use of the term ‘schema’. Analytic generalisation highlights an advantage over the use of statistical generalisation when generalising to ‘like cases’ in that the analytic generalisation “can have implications going well beyond the same kind of case and extend to a whole host of other unlike situations” (Yin, 2014, p 68).

However, the empirical findings from the case study may suggest a new generalisation may have emerged in which an “analytic generalisation may be based on either (a) corroborating, modifying, rejecting, or otherwise advancing theoretical concepts that you reference in designing your case study or (b) new concepts that arose upon the completion of your case study.” Yin, reminds us that the generalisation is made at the conceptual level rather than at the level of the specific case.

Blaikie (2009) believes the aim of using a case study should be to develop theories that can be applied to other cases or situations, and he further believes that Hammersley et al. (2000; in Blaikie, 2009) take the same viewpoint based on their stance that developing theoretical systems should be secondary to finding solutions to practical problems.

This research will focus on the use of analytic generalising based on the concept of safety and its dimensions to provide the comparison model.

3.3 Research Design

There are five key components to the research design of a case study. Yin (2014) identifies them as being:

1. A case study's questions.
2. Its propositions, if any.
3. Its unit(s) of analysis.
4. The logic linking the data to the propositions.
5. The criteria for interpreting the findings.

Research questions

The primary research question in this case study asks:

How does safety culture manifest itself in the English FRS and what are its implications?

This question is supported by the following sub-questions:

1. What are the artefacts of the safety culture in the selected FRSs?
2. What are the beliefs and values of operational staff in regard to the FRS safety culture?
3. What are the underlying assumptions affecting the safety culture of firefighters in the selected FRSs?

4. What are the influences affecting the perceptions of key stakeholders of operational risk to FRS operational personnel?

Theoretical research propositions

The theoretical propositions associated with these research questions are:

a. FRSs have established similar structures, processes and roles to allow their operational staff to operate safely and effectively on the incident ground.

b. There is a similarity in how English FRSs structure themselves, the processes they adopt in providing an emergency service to the community and in regard to the health and safety of their operational staff.

c. That there are differences in the beliefs, values and attitudes to the safety culture between managers and watch based personnel that can be observed.

d. Frontline staff responsible for delivering services perceive risk-taking differently in comparison to their managers.

e. Key stakeholders hold differing views to the level of acceptable risk operational FRS personnel should be allowed to work with.

Units of analysis

In conducting a case study there is the potential to gather a mass of data and information that does not directly inform the research. To answer the research question, obtain the relevant information, and to maximise the use of data gathering resources it is necessary to identify what it is that is being researched and the limits, or boundaries, of that research. This is done by identifying and defining the units of analysis and identifying the boundaries of the research. Yin (2014) highlights the benefits of using the literature research to see what units of analysis have previously been used as they may be used as a guide in developing your own units of analysis and will later provide the opportunity to allow comparisons to be made with the research of others.

The selection and definition of the units of analysis is influenced by the way in which the research questions have been framed and the research propositions (Yin, 2003, 2014). The

selected units become the focus, or the phenomenon, of the case study whilst the remainder are considered for inclusion in the context of the case study. Yin emphasises the need to identify the boundaries and emphasises that the phenomenon cannot be abstract; it may be bounded by a geographical area; and in regard to an organisation, what services are being included in the research. There may also be the requirement to include a time boundary relating to the time limits the research will cover usually included when researching an intervention programme. By creating these boundaries we are scoping the limits of our research.

The unit of analysis, derived from the primary and secondary research questions is the English FRS. The case study is bounded by focussing on the English FRS excluding the Scottish, Welsh and Northern Ireland FRSs (geographical). The roles of individuals within each FRS constitute sub-units of analysis. A further boundary to the research is that the focus is on operational personnel who have a commitment to attend incidents and participate in firefighting, or special service/humanitarian actions, whilst excluding those with no commitment to operational service delivery.

Linking data to propositions

Yin (2014) highlights five methods of linking data to propositions: pattern matching; explanation building; time-series analysis, logic models; and cross-case synthesis. By considering how the data will be linked to the propositions at this early stage, the research design, the process will inform what data will be needed to be collected.

The data in this research will be linked to the propositions in this case study research by pattern matching.

Criteria for interpreting a case study's findings

This final component requires the specification of potential rival explanations that can be anticipated from the case study findings. Yin (2014) informs us that the strength of the case study is enhanced when the researcher can address these rival explanations and then demonstrate why they can be rejected. He advises researchers, during the design of their research that they should seek to anticipate these rival explanations as this knowledge can contribute to identifying the data that will be required to be collected.

3.4 Data sources, types and forms

Data is available from many different sources and the following list highlights those methods that will be used in the course of this research. The addition of surveys highlights the mixed methodology utilising both qualitative and quantitative methods.

Yin (2016) highlights the main categories of sources in conducting research and makes observations on their relevant strengths and weaknesses. This is summarised in Table 3-1.

Table 3-1 Sources of Research Evidence.

Source of Evidence	Strengths	Weaknesses
Documentation	• Stable - can be reviewed repeatedly • Unobtrusive - not created as a result can study • Specific - can contain the exact names, references, and details of an event • Broad - can cover a long span of time, many events, and many settings	• Retrievability - can be difficult to find • Biased selectivity, if collection is incomplete • Reporting bias - reflects (unknown) bias of any given document's author • Access - maybe deliberately withheld
Archival records	• (same as those for documentation) • Precise and usually quantitative	• (same as those for documentation) • Accessibility due to privacy reasons
Interviews	• Targeted - focuses directly on case study topics • Insightful - provides explanations as well as personal views (e.g. perceptions, attitudes, and meanings)	• Bias due to poorly articulated questions • Response bias • Inaccuracies due to poor recall • Reflexivity - interviewee gives what
Direct observations	• Immediacy - covers actions in real-time • Contextual - and cover the case's context	• Time-consuming • Selectivity - broad coverage difficult without a team of observers • Reflexivity - actions may proceed differently because they are being observed • Cost - hours needed by human observers
Participant-observation	• (same as above for direct observations) • Insightful into interpersonal behaviour and motives	• (same as above the direct observations) • Bias due to participant-observer's manipulation of events
Physical artefacts	• Insightful into cultural features • Insightful into technical operations	• Selectivity • Availability

Source: Yin (2014, p106)

For this research, the researcher made use of the following sources of information:

- Observations

  Direct observations were made during the course of riding with a Watch at one station in each of the FRSs participating in this stage of the research. This will include the incidents they attend during this period, during their work routines, and when they are socialising at the station during breaks and at meal-times. The researcher will be in attendance in each FRS for an

approximate period of four weeks when the selected Watch is on-duty both during the day and at night.

Making notes of the observations of subjects in their workplace has its own difficulties that have to be addressed. Some of these difficulties are associated with not alienating Watch based (WB) staff by making them self-conscious and affecting their behaviour, and the physical difficulty in being able to access a tape recorder or notepad carried beneath heavy and bulky personal protective clothing during drills, or at incidents. This was resolved by the researcher finding opportune moments, during the course of the fieldwork, to discreetly withdraw and make quick notes of the event, the respondent or respondents involved, the subjects discussed, and the context in which they occurred. These were typed up as soon as possible and added to NVIVO.

- Interviews

A total of 24 interviews were conducted using a mix of open and semi-structured interviews. The interviewees were drawn from the three role groups adopted for the analysis of the data; Principal Officers (PO), Senior Officers (SO), and Watch-based Staff (WB). The interviewees included representatives from the Fire Brigade Union and some key stakeholder groups. Interviews were conducted in the workplace of the individual or at a location identified and suggested by the interviewee. The data from the interviewees was recorded either by taking hand-written notes at the time or, with the agreement of the interviewee, the interview was recorded on tape. The researcher's preference was to use the tape recorder for interviews as it would allow the researcher to return to the interviews and identify an interviewee's comments within the context at that time. However, in most cases WB staff were uncomfortable with its use. It was explained to the researcher that the use of the recorder was associated with disciplinary or accident interviews, and that it would affect the openness of the information that interviewees would be prepared to share with the researcher. This is a phenomena that the researcher has

experienced both professionally and whilst conducting previous academic research within the FRS. At SO and PO levels there was a greater feeling of ease with the use of a tape recorder with one single exception. The researcher had requested at the start of an interview with one PO to use a tape recorder and its use had been agreed by the interviewee. However, it quickly became apparent that its presence was having a negative effect on the interviewee. This was overcome by the researcher referring to a fault with the tape recorder and suggesting it would be better to use hand written notes if that was acceptable. The interviewee readily agreed and shortly afterwards stated that he/she was more likely to be free and open with their comments if they were not being recorded.

- Focus groups

Two focus groups were used at the beginning of the research to explore the phenomena of safety culture, how it is spoken of by firefighters, and in developing the item statements for use in the survey questionnaire. Focus groups were selected for use in this research for a number of reasons, including:

- Enables data to be collected more quickly and cost effectively from a group of people than by conducting individual interviews.
- Allows non-verbal responses by other members to be observed allowing the researcher to identify possible differences in attitudes or beliefs between group members.
- Allows group members to act on the responses to other group members producing a synergistic effect.

However, one should remember that members of the group are not independent of each other and may be biased by a dominant member of the group. The facilitator of the focus group, in this case the researcher, may also be a cause of bias by unknowingly providing cues.

During the fieldwork an additional nineteen focus groups with WB staff were recorded at their stations which the researcher had personally

attended to deliver and administer the survey questionnaires. These focus groups were held by the researcher following the exit interview on completion of the survey questionnaire with each group consisting of between eight and twelve individuals. This proved useful as the groups were already focused on thinking about safety culture in the FRS from answering the item statements, and the researcher had no need to lead the group and risk introducing his own biases.

To capture the responses of those in each focus group the researcher took handwritten notes having first made a diagram of the seating plan that the Watch had settled into. The Watch officers and the firefighters were identified on that plan and pieces of demographic information added during the course of the focus group. As the researcher would take notes of the thoughts, beliefs, comments made by the participants, or observations made by the researcher, he would index them each by a number according to the seating plan as this was easier than trying to remember the participant's names or initials. Following the focus group the researcher would spend time tidying up the fieldnotes, and later in the day they would be typed up into a Word document to allow them to be entered into the software programme NVIVO.

- Content analysis of documents

  This research made use of the relevant documentation produced by the Department of Communities and Local Government, the Chief Fire and Rescue Advisory Unit, the Health and Safety Executive, The Chief Fire Officers Association, the participating Fire and Rescue Authorities, their FRSs, and from key stakeholder groups. Archived, or no longer readily available, documents were also made available to the researcher by key informants and other FRS staff which allowed comparisons to be made across different versions of documents to determine what changes had previously occurred.

- Surveys

A number of safety culture questionnaires that had been previously developed for use within other industries were considered for use in this research following some changes to the statements to adapt them for use with the FRS. The most promising was that offered by the Health and Safety Laboratory. Based on the feedback of the researcher's key informants the decision was then taken to design and develop a questionnaire specifically for use with the operational staff within English FRSs See section 3.5 for further details in how the questionnaire was developed.

The use of these different sources in answering the research question and its sub-questions is shown in Table 3-2.

Table 3-2. Use of data sources in answering the research questions.

How does safety culture manifest itself in the English FRS and what are its implications?		Questionnaire	Observation	Interview/ Focus groups	Doc Analysis
What are the artefacts of the safety culture in the FRS?	Symbolic elements				
Structures: informal & formal			✓	✓	✓
Processes: informal and formal			✓	✓	✓
Rank and roles; uniform; semi-militaristic			✓	✓	✓
Chief Fire Officer or Chief Executive?				✓	
Symbols: Jargon, metaphors, stories, legends, jokes, anecdotes, topics.			✓	✓	
Behavioural practices, & rituals, material artefacts: assume some meaning greater than intended [sys theory: emergent properties e.g. helmets, leggings, faded denims, Watch Manager uniform]			✓	✓	
What are the beliefs and values of operational staff in regard to the FRS safety culture?	Cognitive elements				
Values: central to the organisational culture's cognitive content			✓	✓	
Norms: rules of conduct, mostly informal, arising from values, representing the directions for everyday behaviour. Overlaps with values.			✓	✓	✓
Attitudes: based on values, induce a certain behaviour as do norms,. Represents beliefs on the object of conduct which produces a certain behaviour.		✓	✓	✓	
High Reliabilty Organisations/Normal Accidents				✓	
What are the underlying assumptions affecting the safety culture of firefighters in the selected FRSs?					
What are the sacred cows?			✓	✓	✓
What are the influences affecting the perceptions of key stakeholders of operational risk to FRS operational personnel?					
Edgeworkers - selection; race & gender; competence; risk governance				✓	✓
Public expectations; legal & regulatory framework; responsibility & accountability				✓	✓
PESTLE analysis				✓	✓
Recruitment & selection				✓	✓
Changes to the organisational culture: selection; equality & diversity;				✓	✓
Number of incidents attended				✓	✓
Fire Brigades Union/Fire Officers Association/Retained Firefighters Union				✓	✓
Work pressures			✓	✓	✓
Competence			✓	✓	✓
Procedures and rules			✓	✓	✓

The fieldwork completed for this research included 845 returned questionnaires, or which 823 were valid; a total of twenty-one focus groups, two of which were with key informant groups, were conducted; twenty-four interviews were held; and observations carried out of WB staff during both on and off-station activities whilst the researcher was with the participating FRSs and attached to the three Watches at their fire stations.

During the course of this research use was made of two specialist research software programmes. The first was SPSS with which to collate and clean the data from the safety culture questionnaire, and to conduct statistical analyses of that data. The second software programme used was NVIVO to bring together the unstructured qualitative data, to categorise that data using primarily the four dimensions that evolved from the factor analysis and principal components analysis. These were supported by a series of sub-categories associated with each dimension, which have provided the basis for some of the sub-headings used in the different chapters in this thesis. The sources of data entered into NVIVO included:

- transcriptions of taped interviews,
- notes made:
    - during the course of the literature review,
    - during the analysis of documents,
    - of interviews,
    - proceedings of the focus groups,
    - observations of subjects being observed in their work environment,
    - researcher's memos to self.

The reference to the use of memos from within NVIVO itself was particularly useful in building the researcher's understanding of the academic literature, through arising patterns and themes, and in relation to the different concepts and how they might be interconnected to one another in a way that may not have been previously clear to a wider audience.

There are 46 English Fire and Rescue Services (FRA) each governed by a fire and rescue authority (FRA) (Communities and Local Government, 2015). The Fire and Rescue Services Act 2004 identifies these FRAs as being either a non-metropolitan county council; a non-metropolitan district council when there is no county council; the London Fire and Emergency Planning Authority (LFEPA), which is responsible for the London Fire Brigade (LFB); or a metropolitan county fire and civil defence authority. The LFB was deliberately excluded from this research due to its unique circumstances, specifically its size both geographically and in the number of operational firefighters employed in comparison to

other FRSs, as research findings related to it may introduce bias when attempting to generalise those findings to other FRSs.

Nine FRSs, representative of the different types of FRS, were invited by letter addressed to their respective Chief Fire Officers to participate. Of these one never responded to the original or subsequent letter; another declined due to the commencement of an internal change programme; a second having initially agreed to participate then withdrew with the explanation that this research was not within the scope of that which they would wish to support; the third FRS in declining said they would reconsider their decision if the researcher were to reapply in 2014. Five FRSs said they would participate in the use of the safety culture questionnaire; three of these FRSs have also agreed to let the researcher ride with a Watch (shift) at one of their stations.

The researcher subsequently did not manage to gain access to one of the three FRSs to ride with a Watch despite the full support of the Chief Fire Officer and one of his Assistant Chief Fire Officers. On reflection this would appear to have more to do with the power of middle managers in this FRS. However, the pilot FRS agreed to step in and to act as the third FRS in the observational stage of the research.

3.5 Developing a survey questionnaire

Safety culture as a 'concept', Wilson (2005) instead uses the term 'construct', consists of a number of dimensions which vary both in number and their content, depending on the author and the industry for which they are used. Coolican (2004) informs us that a test, in this case a questionnaire, which has been standardised on a particular population cannot be used with confidence when applied to a different population. Oppenheim (1992) informs us that a factor analysis would have to be conducted to ensure it was measuring the same thing between different populations. As highlighted previously, the currently available safety culture questionnaires and their items were found to be unsuitable by an initial test group from within the target population due to occupational differences. As a result a decision was taken to develop a specific safety culture questionnaire specifically for use within the English FRS. The purpose of the questionnaire is to identify the key dimensions that personnel in the English FRS identify as contributing to a safety culture

within their occupational group (Rust and Golombok, 1999), and the direction and strength of attitude of the respondents.

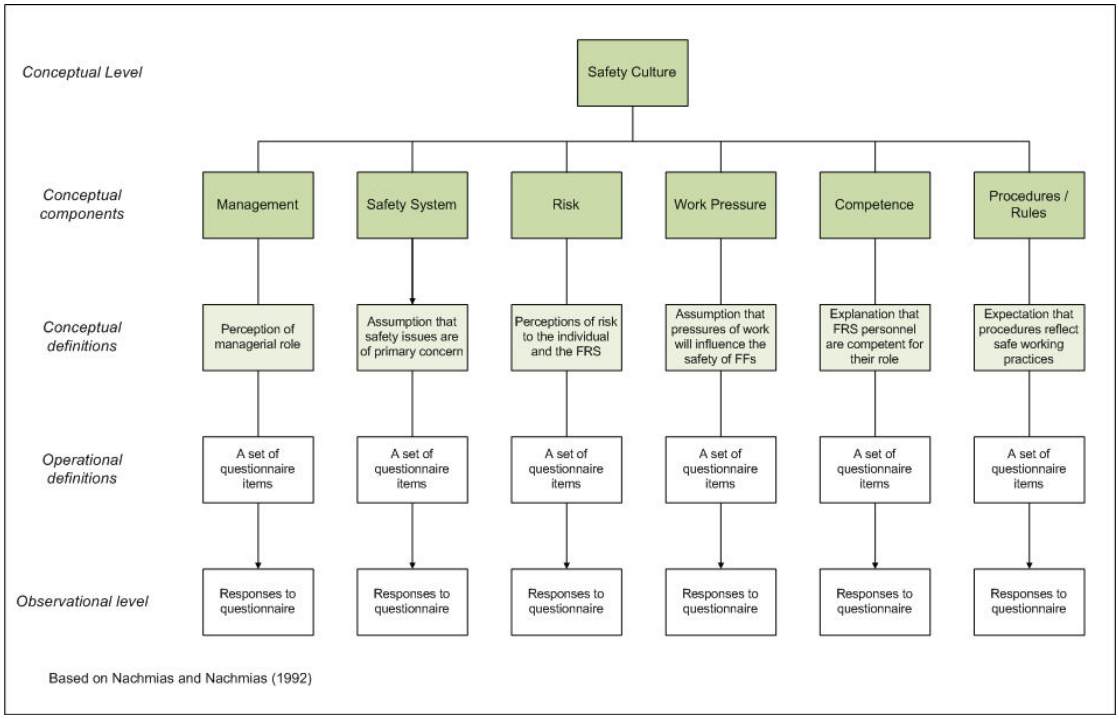
3.5.1 Attitude statements

Examples of current safety culture questionnaires were taken to two different watches and a discussion was initiated with each by the researcher regarding what safety culture consisted of for FRS personnel. The response provided a series of spontaneous statements using their own language, which were then categorised and compared with the dimensions and the statements associated with those of established safety culture questionnaires. A number of established statements could be utilised with some tweaking, others had to be removed, and new statements formulated using the statements provided by the respondents so they were applicable to the FRS as determined by FRS personnel themselves. Once these statements had been reviewed by the researcher and duplications or overlap were removed, and similar statements brought together to make a single statement, they were presented to a select group for the first part of an item analysis. The item analysis was conducted by two senior officers, and a small number of individual WB personnel who made their comments and observations, based on their perceptions, experience and expertise, in looking for ambiguities or subjectivity in the statements. Addressing the comments and observations made, a pool of items was developed. This process identified 183 items which were then reduced by removing duplications and ambiguous items to 82, plus an additional 13 demographic questions. These 82 items were then taken back to the key informants for their comments and observations, which all proved positive. The second phase of an item analysis was to conduct a pilot study (Rust, 1999).

The 82 items, to be included in the pilot study, were thought by the researcher and FRS gatekeepers not to be too onerous for FRS personnel to complete and affect the respondents' concentration or willingness to complete the questionnaire, yet a sufficient sample to ensure the reliability of the results. Rust (1999) suggests that the pilot should contain at least 50% more items than being planned for use in the final version of the questionnaire to be used. The items were checked to ensure there were an equal number that had been allowed to manifest either positively or negatively as outlined by Oppenheim (1992). This assists in overcoming a response bias in which respondents tend to agree with

statements as opposed to disagreeing with them. They were then assembled into a random order and incorporated into a pilot questionnaire using MS Access. The last page of the questionnaire invited respondents to add any free-response comments they wished to make. During this phase of the research work the following conceptual dimensions started to evolve during the processes and are shown in Figure 3-2. The pilot questionnaire was then taken to a small number of individuals in different roles (the UK FRS has moved from a rank structure to one of roles) and time was spent with these individuals to ensure the items were being interpreted in the way intended and that the language they were framed in was clear and with no ambiguities (Leedy and Ormrod, 2005).

Figure 3-2 Initial components for the concept safety culture.



Based on Nachmias and Nachmias (1992)

3.5.2 Piloting the Questionnaire

A single FRS, representative of the English FRS population, and which had previously indicated it was willing to participate in this research, was approached by letter to the Chief Fire Officer (CFO) asking permission to distribute the pilot questionnaire to his operational personnel, Assurances were stated in that letter regarding the purpose of the questionnaire, issues regarding confidentiality, and rights of the individuals participating.

With the CFO's agreement contact was made with the local Fire Brigades Union representative and the same assurances were given and it was highlighted that completion of the questionnaire was on a voluntary basis. Both the CFO and the FBU agreed to support the research. It was intended to include wholetime (WT), day manning, and on-call (OC) firefighters. This would provide a representation of the full range of the demographics and characteristics within the target FRS population. In consultation with the appointed liaison officer it was agreed that as the on-call firefighters only congregate for a three hour period one evening a week, during which administration procedures and safety checks have to be completed plus training to keep their training and training records up to date, it would not be feasible to have the questionnaires completed as a group. It was decided that questionnaires would be sent to the designated station managers responsible for the OC and they would distribute them to their staff to be completed at a time suitable to them. Completed questionnaires would be returned to the Health and Safety section, which is generally viewed as being neutral in any internal FRS politics. Thought had been given to producing the questionnaire so that it could be emailed to individuals using their FRS personal email address but there were concerns raised regarding 'bulk' emails and the effect on the FRS's internal mail system. It was also suggested that some didn't use their FRS email accounts very often so the questionnaire may not be discovered and dealt with in a timely manner. Pragmatically, it would be difficult for WB staff to complete the questionnaire using a FRS computer as there were only two computers available at each station and these were usually in heavy demand for virtual training by personnel, and the completion of administrative returns by Watch officers. The computers were also located in general areas which could affect how individuals might be affected with colleagues potentially looking over their shoulder when answering the questions.

The researcher visited each wholetime watch whilst they were on duty at their station in the pilot FRS. The purpose of the questionnaire; anonymity and confidentiality; the rights of the individual to withdraw their participation; an explanation of the response scale being used; that statements were phrased in either negative or positive terms; and the estimated time to complete was explained to Watch personnel followed by the questionnaire being distributed, and completed. The questionnaires were to be completed in what Oppenheim (1992) categorises as 'group administered', that is within a group setting and personnel were asked to not copy, talk or ask questions amongst themselves until everyone had finished. If the individual did not have a pen to hand one was made available by the

researcher. Before collecting the completed questionnaires the Watch members were given a group exit-interview (Wilson, 2005) and asked for their comments and observations on the items for any ambiguities, what might be missing, and how the general layout of the questionnaire might be improved. For those WB personnel not on duty due to being on courses, leave or were sick, blank copies were left for the Watch Manager (WM) to distribute. Completed questionnaires were to be posted via the internal mail in a sealed envelope to the FRS Health and Safety section where the researcher would collect them at a later date. Senior officers and other FRS personnel that were not watch-based, but had an operational commitment, had a questionnaire posted to them via the FRS's internal mail system. Each questionnaire was placed in an addressed envelope with a covering letter, stating the same information that had been given to WB staff, and a stamped envelope addressed direct to the researcher.

This process of piloting the questionnaire also provided the opportunity to trial the administrative procedures for collecting the data using the questionnaire before commencing with the full-scale process of data collection for the research.

Of the 215 questionnaires distributed 147 were completed and returned; a response rate of 68%. This response rate exceeded the numbers required for use in a factor analysis which requires a minimum of 100 (Gorsuch, 1974; and Oppenheim, 1992; both referred to in Wilson, 2005) and should exceed the number of items in the questionnaire (82 items) (Rust, 1999).

3.5.3 Item Rating Scale

The item rating scale allows the respondent to score each statement as to whether they agreed or disagreed and is commonly used in person-based questionnaires: a Likert scale was chosen for this purpose for use in this research. Hales (1986, in Coolican, 2004) believes that Likert scales can be considered a safer form by which to collect attitude data as it acknowledges the subjectivity involved between the respondent and the researcher. Rust (1999) informs us that a Likert scale will usually have at least four options and as many as seven. By selecting a seven-scale Likert rating system we allow respondents to differentiate to a greater degree and allow them to record their response more precisely. However, Rust does highlight that with an odd numbered scale there is a tendency to choose the middle rating. Coolican (2004) believes that scoring in the centre is ambiguous

in that it can reflect someone who has no particular opinion regarding the statement, or alternatively, someone who is torn between agreeing or disagreeing. This was discussed with a number of FRS staff and the general view was that it allowed individuals to record an honest answer should they have no particular view regarding that statement rather than forcing them to agree or disagree when neither reflected their actual attitude. This view was later confirmed during the piloting of the questionnaire. The data collected using the questionnaire would be treated as ordinal. Sommers and Sommers (1997) informs us that ordinal data can provide information regarding the size, or intensity, and direction of responses. The seven scores selected were Strongly Disagree; Disagree; Slightly Disagree; Neither Agree or Disagree; Slightly Agree; Agree; Strongly Agree.

3.5.4 Collating the collected data

On receipt of completed questionnaires the data was then transferred to an MS Excel spreadsheet with each anonymous questionnaire being given a unique identifying code consisting of a letter to identify the FRS and a number indicating the sequence in which the data was entered. Six questionnaires were received past the due date and were not included in the analysis of the data. Every tenth questionnaire was checked to identify any inaccuracies in the data entry process. Once the data had been inputted the scores for the negative statements were reversed.

The data was then transferred into the software programme SPSS so as to determine the underlying structure of the correlation matrix based on the collected data of the pilot study using factor analysis. The results of the factor analysis are shown in Chapter 4.

On completion of the factor analysis a questionnaire was then produced based on the selected questions that were included in a random order with approximately half of the questions reversed. The questionnaire was then distributed across five FRSs and used to provide an indication of the strength of attitudes of firefighters and officers in regard to safety culture as it applies within their FRS. A total of 845 questionnaires were returned of which 22 were excluded. Reasons for exclusion included one that had been completed by a non-operational member of staff who was outside of the scope of this research. The remainder were only part completed of which two participants indicated that it was a waste of time as nothing would change as a result. The remainder were incomplete over

the later part of the questionnaire which can be explained by specialist appliance crews being called to attend an incident and their questionnaires being gathered and posted before their return to duty at their own station. Adding to this assumption, based on specialist appliance crews, was that the uncompleted questionnaires tended to be found in pairs or three at a time that relates to the crewing levels for most specialist appliances.

Use of a MS Excel spreadsheet allowed additional formatting to be applied to assist with the visual analysis of the data as part of the process to check the reliability of the data entry. The spreadsheet used colour coding of groups of spreadsheet columns to reflect each page of the questionnaire. This allowed any mistakes in failing to enter a response to be quickly captured for each individual page of questions rather than at the end of the data entry process. Conditional formatting of cells allowed any entries that were outside of the expected range of responses to be highlighted. Missing responses were allocated the number '999', which was recorded in the codebook established for this research, to help differentiate between a legitimate 'no response' and those that were inadvertently omitted during the process of data entry. The data was then transferred to an SPSS worksheet where statistical and descriptive analyses of the data were conducted. A second check of the reliability of the data entry was conducted within SPSS using the frequencies of responses to identify any anomalies for each of the variables based on the individual responses recorded for each of the subjects. For those questions with scores that needed to be reversed this was conducted by recoding into a new variable. The level of response in returning completed questionnaires by each participating FRS is shown in Table 3-3. The total number of valid responses were 823 (33.4%) based on the Wholetime establishment figure for each of the participating FRSs for 2015. The response rate is likely to be higher than stated as the actual numbers of staff, are likely to be lower than the establishment figure whilst positions remain unfilled during the recruitment freeze that FRSs are currently operating as part of local FRA austerity measures.

Table 3-3. Evaluation of the questionnaire response rate.

Questionnaire response rate			
FRS	<=WM %	=>SM %	Total %
1	47.9	25.9	44.8
2	22.7	20.0	23.1
3	23.6	15.9	23.6
4	32.1	47.7	33.3
5	78.8	24.1	73.2

Total response rate was 33.4%

Note: WM relates to a Watch Manager and SM a Station Manager.

The difference in response rates between FRSs 1 and 5 when compared to FRSs 2, 3 and 4 was attributed by the researcher to the level of support and activity of the liaison officers within their own FRSs.

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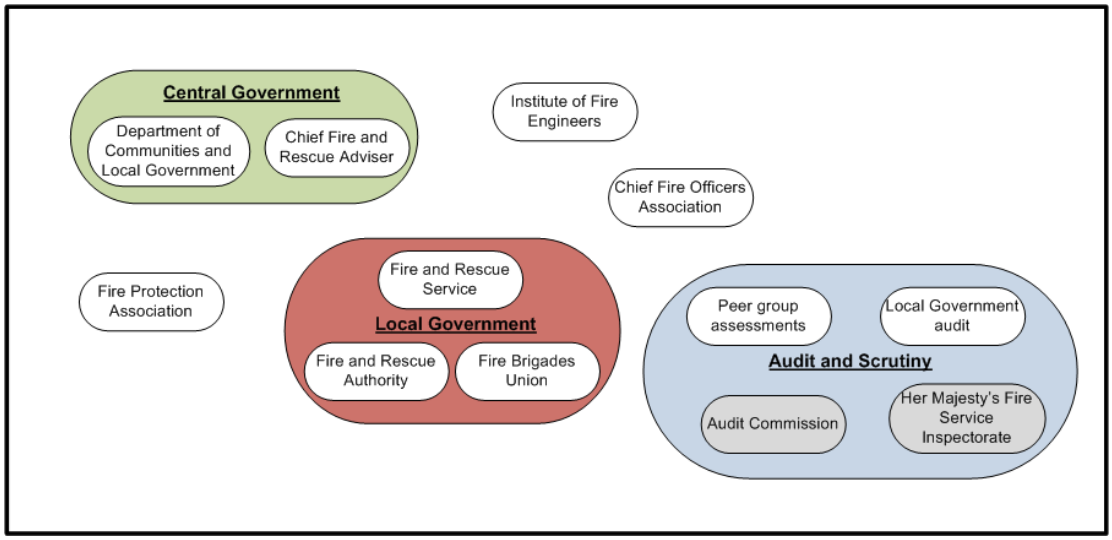
Chapter 4 Research Findings

This chapter sets out to identify the contextual factors that were identified during the fieldwork from documents identified by interviewees and staff of the different FRSs that have, and continue to, influence the English FRS that may have contributed to the increase in the number of firefighter fatalities. A number of key incidents and their outcomes that made them so important are summarised so as to highlight their impact on the safety culture of the FRS in England. A key factor to successful outcomes on the incident ground is the leadership provided, conducting risk assessments, and in making decisions in dynamic situations which are discussed in some detail in the following sections. The chapter then moves on to look at competence and how it is achieved within the FRS following the introduction of the Integrated Personal Development System (IPDS). Then the construction of the survey questionnaire and its piloting is addressed before moving onto the factorial analysis to determine the dimensions arising from the responses, and then the distribution of the final version of the questionnaire. The remainder of the chapter then focuses on the responses related to the four dimensions derived from the factor analysis and conducting statistical analyses on each dimension using the five FRSs, and the three role groups as the independent variables. The final analyses relate to the concept of safety culture, based on the four dimensions using the same independent variables.

4.1 Contextual factors

In using a case study Yin (2014) informs us that the case being studied will be situated in its own context. The boundary separating the contextual factors and the case will be blurred leaving the researcher to decide what should be included either side of that boundary. To provide that necessary context this section will first identify the key stakeholders included in this research, and then explain their individual role and relationships in regard to the FRS, and the major changes that may have affected firefighters' safety and their working environment. It will provide some historical background information including pivotal operational incidents regarding firefighter safety on the incident ground. To identify the key stakeholders specific to this research a systems map was produced and is replicated in Figure 4-1.

Figure 4-1. Systems map of key stakeholder groups.



4.1.1 Central Government

Department of Communities and Local Government (CLG): Within central government all English FRSs currently come under the remit of the government's CLG. A lot of work had previously been undertaken by individual FRSs in areas to do with equal opportunities, competency based training, and community fire safety initiatives, but it was piecemeal and the overall effect was localised. As one Interviewee described the English FRS, "They are a collection of fiefdoms, each with its own Baron jockeying for position". The most significant, and controversial, catalyst for change was Sir George Bain's report (Bain et al., 2002) based on their independent review of the FRS in England commissioned by the Labour government. They found that industrial relations were poor, the system of management was weak, and that there was a lack of feeling of ownership by FRS managers. The report highlighted that progress in changing the FRS had been in small increments, and he attributed this to failures of leadership at political, institutional and operational levels. What Bain et al. believed was necessary to bring about the necessary changes was strong leadership from government in the form of a policy-making body led by the Office of the Deputy Prime Minister, the predecessor to the CLG, to modernise the FRS. What was critical in making this change was the need to reposition the Fire Service so that it focussed "on reducing rather than responding to incidents" (Bain et al., 2002, p iii), in effect moving from

a reactive to a proactive role, i.e. from firefighting to one of fire prevention. To achieve this, the Fire Service was to engage with the community and by providing a community fire safety approach to facilitate the required change.

Bain et al. (2002) recognised calls for, but did not address, nationalisation or regionalisation of the FRS. They did recommend that FRSs should seek to work in closer co-operation with each other and other stakeholders in the community. Three organisations were specifically identified in his report as having a crucial role during and subsequent to the period of change. The first was the Fire Service College (FSC) which is the national college for training firefighters and fire officers in England and Wales. Bain et al. envisaged the FSC would become the focal point for new innovation and ways of thinking within the Fire Service to equip it for the future. The second organisation was HMFSI who Bain et al. (2002, p iv) thought appropriately placed to become "a major engine for change… in driving through the reforms we propose" which resulted in the ODPM establishing the Fire and Rescue Service Improvement Programme (FRSIP) staffed by HMFSI personnel. However, to enable them to undertake this new work the inspection of FRSs by HMFSI were to cease, and Bain recommended that this inspection work to be undertaken by the third organisation, the Audit Commission.

FRS policies and practices were of concern to Bain et al. including human resources, and particularly in regard to diversity, harassment and bullying. This was a follow-on from the Thematic Review undertaken by HMFSI (1999a, p v-vi) in regard to FRS culture which polarised the opinion of FRS personnel. The work already being undertaken in the provision of training and individual competence was seen as a means to promote diversity and a means by which to establish a new pay structure. Senior staff were criticised in that they needed more training in general and personnel management, and that "a proportion of officers should come from outside of the service." Bain et al. identified a requirement to make changes to the national conditions of service as outlined within the 'Grey Book'. This would provide FRS managers with the ability to change conditions locally, which were expected to include introducing flexible shift patterns; part-time working; and different crewing trends at different times of the day to meet changing demands on the FRS. The relationship between WT and OC firefighters was an issue for Bain et al. and their view was that OC firefighters were seen as 'second-class'. Changes needed to be made to allow OC firefighters "to play their full part in protecting the community". To accomplish this they

were to be paid the same hourly rate as wholetime firefighters, they were to meet the same medical and training standards "so that they can be fully interchangeable. Wholetime firefighters should be able to undertake retained roles if they wish."

To achieve these aims a Draft National Framework document (Office of the Deputy Prime Minister, 2004) was produced for consultation outlining the vision of how this was to be done, and the priorities in achieving the expected outcomes. Updated versions took into account what had been achieved from previous versions with the most recent edition being the National Framework (Communities and Local Government, 2012). The responsibility for producing the Fire and Rescue National Framework is that of the Secretary of State as stated in the Fire and Rescue Service Act, 2004, Section 21.

The central government, in attempting to balance the national budget and in a time of austerity measures, has substantially reduced the size of the Revenue Support Grant[2] (RSG) made to local authorities of which the FRAs are part. The Local Government Association (LGA) (2014) anticipates that the RSG will continue to be reduced annually by central government in future years.

Central government is also seeking changes to the age at which individuals within the public sector can retire. Under the Firefighters Pension Scheme 1992, Section A13, a WT member of the FRS who is in a firefighting role, or might be expected to be called upon to engage in firefighting, would retire at the maximum age of 55 if a Station Officer (Watch Manager) or below. For an Assistant Divisional Officer or above the retirement age was 60 as their role on the incident ground was seen to be less arduous. If the FRA was satisfied that for the purposes of maintaining FRS efficiency then these age limits, in a case by case review, could be extended. Section A14 informs us that in the interests of efficiency a WT member who is or may be required to engage in firefighting, and had reached the age of 50, having completed 25 years of service, may be required by the FRA "to retire on the grounds that his retention in the brigade would not be in the general interests of its efficiency". These stipulations within these sections were in recognition that, in general terms, at 50 years of age an operational firefighter was no longer physically able to carry out the role. Central government (HM Government, 2015b), in responding to frequently asked questions, states that under the Public Service Pensions Act 2013 the normal pension age for the Firefighters

[2] AnyFire (Local Government Association, 2014) informs us that the Revenue Support Grant now forms part of the Settlement Funding Allocation.

Pension Scheme 2015 is now 60 and that "The 2015 scheme makes no changes to fitness or capability tests or regimes *(allowing for age differences)*, which are a matter for employers." A briefing note for Members of Parliament (HM Government, 2015a) assures MPs that "The majority of firefighters should be able to work until 60 by doing the average amount of exercise recommended for all adults.

Chief Fire and Rescue Adviser (CFRA): The CFRA is employed by CLG and provides strategic advice and guidance to ministers, civil servants, Fire and Rescue Authorities (FRA) in England and other partners (including the devolved administrations, the police and Health and Safety Executive), on the structure, organisation and performance of fire and rescue authorities. The CFRA formerly ran the Chief Fire and Rescue Advisory Unit (CFRAU) but the CFAU would appear to have quietly disappeared and now replaced by the Fire and Rescue Advisory Team (FRAT).

Health and Safety Executive (HSE): The website of the HSE states that "Our mission is to prevent death, injury and ill health in Great Britain's workplaces." Their statutory function is to "propose new laws, update previous laws and standards, conduct research, provide information and advice, and provide arrangements for the enforcement of health and safety law". The HSE and other enforcing authorities are responsible for enforcing the Health and Safety at Work Act 1974 and its associated statutory instruments, or regulations. The HSE can issue notices under the headings of Improvement, Prohibition, Selection of the Appropriate, and Crown Notices. The Improvement and Prohibition Notices are applicable to the FRS. An Improvement Notice can be served when an HSE Inspector believes that the Health and Safety at Work Act 1974 has been contravened, and that any contraventions are likely to continue or be repeated. The notice will require the causes to any contraventions to be remedied within a set time period. A Prohibition Notice relates to those activities that a person is in control of, and when the Inspector believes there is a risk of serious personal injury; in which case the Prohibition Notice will be served on that person. The Notice requires that the activity should not be continued, or remain under the control of the person who has been served the notice, until the matters the Inspector has identified have been remedied. In the event of a work-related fatality, then under the Corporate Manslaughter and Corporate Homicide Act 2007, it is the police that will conduct the subsequent investigation and for the Crown Prosecution Service to decide whether there is sufficient evidence for a prosecution (Health and Safety Executive, n.d.-c).

4.1.2 Local Government

Fire and Rescue Authority (FRA)

What constitutes a FRA is designated within the Fire and Rescue Service Act 2004. Section (1)(2) of that Act for England identifies a FRA to be:

(a) a non-metropolitan county council is the fire and rescue authority for the county;

(b) a non-metropolitan district council for an area for which there is no county council is the fire and rescue authority for the area;

(c) the London Fire and Emergency Planning Authority is the fire and rescue authority for Greater London;

(d) a metropolitan county fire and civil defence authority is the fire and rescue authority for the county;

(e) the Council of the Isles of Scilly is the fire and rescue authority for the Isles of Scilly.

The FRA consists of elected members of the council who, in general terms, are to ensure the promotion of fire safety in its area by giving advice on how to prevent fires, and death or injury resulting from fires; ensure the provision of trained personnel, services and equipment to fight fires; rescuing and protecting people in the event of a road traffic accident. Their role is similar to that of directors with the Chair of the FRA equating to the Chair of the Board of a public company.

The Local Government Association (LGA)

The LGA is a cross-party organisation representing local authorities in England with the aim of influencing central government in regard to improving the delivery of national services by local authorities. FRAs are one part of a local authority represented by metropolitan, combined, and county fire authorities. In their paper on future funding for FRAs AnyFire (Local Government Association, 2014) points out that every FRA has had to make significant

savings without having so far had significant impact on the delivery of services or putting the community at risk. This is a view not shared by the FBU, or the majority of its membership, who are concerned regarding the safety of not only members of the community but that of firefighters. However, the LGA anticipates a 'tipping point' is approaching with increased funding reductions and increased costs associated with pension costs and national insurance contributions.

In 2013 Sir Ken Knight, the first CFRA following the demise of HMFSI, produced his paper 'Facing the Future' (2013) in which he criticised the FRAs for not effectively grasping the opportunity to make the changes expected of them particularly in light of the following figures based on CLG data:

- Overall attendance at incidents is down 40%
- attendance at fires is down 48%
- building fires, down 39%
- minor outdoor fires, down 44%
- Road traffic collisions, down 24%
- flooding, down 8%

Source: (Knight, 2013, p11)

In the footnote on page 11 of his report, Sir Ken Knight informs us that in regard to fire deaths in 2011-12 there were 186 fire fatalities which represented a 60% reduction from the totals that were typical of the 1980's. Despite the media, public, and FBU concerns regarding the increased number of firefighter deaths he also stated that firefighters are now much safer today than before. He expressed his disappointment that with this diminishing demand on the services of the FRAs there was no corresponding decrease in resourcing, i.e. the number of firefighters, middle managers, appliances and stations, to meet the reducing risk. Instead FRAs were relying on not filling vacancies as staff retired and placing a freeze on recruitment of new staff. He advocated a move from the traditional use of WT firefighters and a greater use of OC firefighters, with greater use of dual contracts where firefighters on WT contracts could also be employed as OC firefighters. Sir

Ken Knight also highlights a number of FRAs that have not reformed their flexible-duty system for SOs, which is different from the duty system of station based personnel on a Watch duty system. He believes that this is impeding the time that SOs could be spending on managerial duties. A point to note here is Sir Ken Knight's emphasis on managerial duties and not on developing their own knowledge, skills, and competence in the operational environment; this is discussed further in the next Chapter. The FBU report (2013a) counters many of Sir Ken Knight's points and offers a different perspective.

Fire and Rescue Service

The FRS is governed by its principle officers (PO) whose role is similar to that of executive directors in other industries, with the Chief Fire Officer (CFO) taking the role of the Chief Executive. Some directors are non-uniformed posts particularly in the specialist roles of finance, and human resources. The number of POs across the English FRSs has been reduced to meet the demands of austerity and in seeking savings, so as directors retire their positions have been made redundant resulting in changes in FRS governance structures.

4.1.3 Audit and Scrutiny

Historically, the FRSs in England and Wales were inspected by HMFSI once a year. Following the Bain Report (Bain et al., 2002) the inspection role was removed from HMFSI, and on completion of the FRS modernisation programme HMFSI was dissolved. Scotland, with its devolved powers, decided to follow the same route and appointed its own Scottish CFRA chief advisor and CFRA unit replicating that established in England. In 2013 the Scottish Government reversed this decision and they once again established HMFSI (Scotland) to provide, under the Police and Fire Reform (Scotland) Act (Scottish Government, 2012), key aspects which included "regular, formal opportunities for the Scottish parliament to scrutinise fire and rescue services… by the creation of an inspectorate of the Scottish fire and rescue service" (in Fire Brigades Union, 2013b).

The Audit Commission (AC) was then appointed the successor to HMFSI in the role of inspecting FRSs in England. These inspections were undertaken by using the Comprehensive Performance Assessment (CPA) which was introduced in 2005 and incorporated the AC's rating system using the terms excellent, good, fair, weak, or poor with the focus being on

staff training, budget management, and work within the community to reduce fires. In 2006 the assessments were re-titled Fire and Rescue Performance Assessment and the assessments of performance were now scored as Inadequate, Adequate, Performing well, or Performing strongly. In 2007 the assessments were then focussed on three key areas: the progress made in the previous year; the management of finances and in providing value for money; and how the services of the FRS are delivered. These assessments were conducted by joint teams led by the AC and accompanied by seconded FRS officers, independent to the FRS being inspected, to assist in the areas where the AC did not have the expertise to form a judgement. The AC then announced in 2009 the introduction of the Comprehensive Area Assessment (CAA) which provided the new framework with which local public services in England would be inspected, and was acclaimed by the AC as a fundamental change in how those services were to be assessed. A new National Indicator Set had been introduced to simplify and reduce the amount of data FRSs and central government was having to collect. The CAA consisted of two elements: an area assessment and an organisational assessment. The FRS was to be assessed against the Fire and Rescue Service National Framework document and made a specific point of considering within its assessment as to "how well equality and diversity are fully integrated into all aspects of the service" (Audit Commission, 2013, p33). The FRS Operational Assessment Toolkit was designed with input from the LGA, CFRA, CFOA, and within the Key Lines of Enquiry (KLOE) FRSs would be asked to demonstrate and provide evidence in regard to:

- *(Is the FRS)* "operationally effective, demonstrating operational preparedness and the ability to deliver an emergency response where both public and firefighter safety are paramount;"

- *(Does the FRS have)* "the capacity to deliver its future priorities ensuring that staff work safely and effectively:"

(Audit Commission, 2009, p8-9)

The AC had the responsibility for providing assurance through the use of this framework and for the appointment of auditors. As part of the process the AC sought to involve 'experts by experience' and peers in these procedures. The AC was subsequently dissolved in April 2015 and the LGA and CFOA in partnership designed the replacement assessment process, the Operational Assessment and Fire Peer Challenge programme (OpA), replacing

the CAA introduced by the AC, and which was itself 'refreshed' in 2015. The OpA is a reflection of the move to sector-led improvement and greater local accountability based on three-yearly assessments, although FRAs can now commission another Fire Peer Challenge at a time of their choosing if they so wish (Local Government Association, 2015). One can see the level of constant change to FRS scrutiny that the English FRSs have been subjected to over that period of time

4.1.4 Other stakeholders

Fire Brigades Union (FBU): The FBU is the dominant operational staff representative body within the English FRS, and indeed of the UK FRSs as a whole, by virtue of the size of its membership resulting in it exercising considerable influence within the FRS. It represents firefighters, junior and middle ranking officers, both WT and a proportion of OC staff. The FBU represents its members regarding pay and conditions, and has been in the forefront of promoting equality and diversity within the FRS, and the introduction and development of the IPDS.

There is also a representative body specifically for OC firefighters, the Retained Firefighters Union, and another for fire officers, the Fire Officers Association. The FBU (2004) successfully championed the case that the OC firefighter faced the same risks and carried out the same job as the WT firefighter and should therefore receive the same rate of pay and pension rights. They also argued that the OC firefighter must be provided with more time to train and develop their competence, which should include drill (practice using the equipment and standard operational procedures); community fire safety training; command and control training; and maintenance and testing of equipment, all of which required their inclusion within the IPDS. This would also provide opportunities to develop their careers within the FRS.

The FBU's current focus is with challenging central government over the change to FRS pensions and the proposed increase to the retirement age for firefighters from the modernisation programme. Other issues include the effects of austerity on the FRS which has resulted in firefighter posts being lost; the number of appliances being reduced, changes to work patterns from stations being staffed by WT firefighters on 24/7 duties to other shift patterns; and the closure of stations.

Chief Fire Officers Association (CFOA): The CFOA previously acted as a sounding board providing professional advice to central government. Its membership was exclusively restricted to POs in the ranks of Chief Fire Officers, Deputy Chief Fire Officers, and Assistant Chief Fire Officers. Following the demise of HMFSI there was a gap regarding the development of new policy and guidance documents and updating older documents; a role now undertaken by the CFOA. Following the modernisation programme the CFOA introduced its trading arm so it is now the CFOA Group consisting of CFOA, operating as a charity, and as a company which is limited by guarantee overseeing three subsidiary companies.

On its website the CFOA advertises itself as:

> "CFOA is the professional voice of the UK fire and rescue service, supporting members to fulfil their leadership role in protecting local communities and making life safer through improved service delivery. Providing professional advice to inform government policy, CFOA is committed to developing both strategic and technical guidance and sharing notable practice within the wider FRS. All the senior management within fire and rescue services across the UK are eligible for membership of the Association. CFOA is the driving force in managing change and implementing reforms in the service."

Within its strategic objectives it includes influencing, lobbying and shaping national policy, and enabling its members to deliver its national programme of work.

Fire Protection Association (FPA): The FPA is the largest national fire safety organisation within the UK and seeks to identify and raise attention to the dangers of fire and how the potential for loss to fire can be minimised. They have expressed their concern that whilst the number of fires is reducing the costs due to fire are increasing leading the FPA to commission an independent report on the FRS.

Institution of Fire Engineers (IFE): The IFE is a registered charity that can provide FRS based academic knowledge, assess that knowledge by examination, and taking into account the individual's professional experience then award membership grades to members of the Institution including professional engineering qualifications such as Chartered Engineer. The IFE maintains a number of branches across the UK and internationally. Previously, before the change in how staff could be promoted based on competence and development programmes (IPDS), individuals in the ranks of Leading Firefighter (now Crew Manager), and Sub Officer (now Watch Manager) had to pass both a written examination and a practical examination, followed by an interview before they could be promoted. For the

rank of Station Officer the written examination consisted of four papers but individuals could be exempted this written examination if they had passed the IFE Graduate's examination which also consisted of four examinations. In some FRSs at that time it was a requirement to have this IFE qualification for further promotion, and preferably to have passed the IFE Member's examination.

4.2 Milestone incidents

Firefighter deaths

The Labour Research Department report (2008) highlights the number of firefighter deaths in the UK from 1978-2008 were 82 firefighter deaths recorded whilst on operational duties of which 44 UK firefighters died whilst attending fires; 29 deaths in Road Traffic Collisions (previously referred to as Road Traffic Accidents); and 13 during training. Towards the end of the century there was a downwards trend pattern, and during the period from 1996 to October 2002 there were no firefighter deaths recorded at fires. Then, over the period 2003-2007 there were 13 firefighter deaths recorded whilst attending fires (Labour Research Department, 2008, p16-17). Over the period 2007-2008, using the data for firefighter deaths held by the Health and Safety Executive, the Labour Research Department made a comparison between firefighter deaths and those in the agriculture, construction and the manufacturing industries:

Death Rates per 100,000 workers

Agriculture	9.1 deaths
Construction	3.4 deaths
Manufacturing	1.1 deaths
Firefighting	15.4 deaths

Using the Labour Research Department's figures it appears that firefighter deaths have been higher than those industries normally associated with the highest fatality rates. The following sections relate to specific events that have affected the English FRSs, and by implication the wider UK FRSs, and how they have affected how FRSs now operate at

emergency incidents. The first incident, is that of the 7/7 bombings in London in 2005 where the London Fire Brigade was criticised for sticking rigidly to procedures; The second incident is regarding the death of a member of the public having fallen into a disused coal-mine shaft in Galston, Ayrshire Scotland in 2008. Although this incident occurred outside of the boundary of the English FRS it has had a significant impact and is well known within the English FRS, with some FRSs having used it as the basis for a table-top training scenario. The third 'incident' actually refers to two incidents that took place in 2012 involving incidents on boating ponds in different FRSs, for which both FRSs were severely criticised by members of the public and the media for their lack of action based on their compliance with safe systems of work. The fourth incident is the fatal fire at Gillender Street 1991 following which the London Fire Brigade was served with two Improvement Notices by the HSE. The resulting changes implemented by the LFB were to be adopted piecemeal by some FRSs, and following the FRS modernisation programme in England were subsequently to become embedded across the UK FRSs. The fifth incident, in a lake at Simon's Lodge, Greater Manchester, was very high profile within the UK FRS in 1999 as it was the first and only incident following which a principal officer was facing a charge under the Manslaughter Act and this incident was the catalyst for procedures being developed for every foreseeable risk FRSs could envisage. The final incident is of a fire at a warehouse in Atherstone on Stour, Warwickshire, in which four members of the FRS lost their lives and three officers were charged under the Corporate Manslaughter and Corporate Homicide Act 2007.

The two incidents at Atherstone-on-Stour and the Galston mineshaft had a far reaching effect in that the HSE saw fit, following discussions with the FRS, to issue a document which stated "how the FRS should comply with health and safety at work duties within their operational work." This document generated more questions than it answered and a second statement was subsequently produced (Health and Safety Executive, n.d.-a). This second document has also been questioned by members of different FRSs who believe it still does not sufficiently clarify the situation for FRS personnel. Based on these high-profile incidents over recent years a number of interviewees in this research used the following expression "You are damned if you do, and damned if you don't".

4.2.1 "Damned if you do… (comply with safe systems of work)"

The 7/7 bombings of the London Unground, 2005

On the 7th July 2005 four bombs were detonated on the London Underground system and 52 people lost their lives. In her inquest report the Rt. Hon. Lady Justice Hallett (2011) identified issues with the training of the emergency services. She acknowledged the extensive level of inter-agency training at Gold (strategic) and Silver (operational) levels, but noted that there was considerably less inter-agency training available for the 'frontline' personnel that are first in attendance, and who are presented with a scene of chaos, and confusion (the tactical level). However, she also recognised there are considerable logistical and financial difficulties in providing this training to all personnel. In the inquest the London Fire Brigade (LFB) was criticised by witnesses, including a British Transport Police Inspector, for not taking action. The first criticism related to firefighters not entering the scene of the explosions because their procedures for the wearing of breathing apparatus prevented them deploying into the tunnels although members of the public and London Underground (LU) staff were able to breathe in the atmosphere present. The second criticism was again to do with LFB procedures in that they did not allow firefighters to work on the track due to the electrified track lines whilst they awaited confirmation from the LFB's control room that the power to the lines had been switched off. This was despite LU staff at the scene of the incident having put in place short-circuit devices to cut the power and there being hundreds of passengers, staff, and other emergency responders from other agencies already in the vicinity of these same tracks. The coroner made comments on the LFB's operational discretion (Hallett, 2011, p49-51) in which she said that at times criticism of individuals, or organisations, regarding the interpretation of HSE legislation may be justified but the LFB and its firefighters should not be unfairly criticised as:

> "the LFB would be failing in its duty if it failed to train its officers in risk assessment or its firefighters to follow orders. If a fire officer allowed individual firefighters to follow their instincts and rushing to a dangerous situation, ill-prepared and ill-equipped without proper backup, and lives were saved, no public criticism would follow. However, if the officer did the same and someone died, the officer or their organisation could find themselves in the dock facing criminal charges or in a civil court facing a claim for damages. As one LFB witness put it rather ruefully: 'it all depends on the result'."

Hallett (2011, p49) recognised that this incident had raised questions whether 'in striking the balance', referring to the HSE paper of that name, between complying with procedures

in the context of the situation they are presented with, she asked were firefighters being given sufficient discretion in their decision-making. She believed the answer lies with the use of "judgement, common sense and what the LFB call 'dynamic risk assessments'." Hallet (2001, p50-51) went on to say "I would hope that employees are reminded that protocols *(procedures)* are designed to save lives. Depending on the dynamics of the situation, which may change rapidly, protocols may be approached with a degree of flexibility, without putting fire crews unnecessarily at risk… (*the method of assessment of operational risks*) are matters for it (*the LFB*) to determine, provided that its policies and procedures do not unnecessarily restrict the discretion of officers on the ground, which I am assured they do not." The Rt. Hon. Lady Justice Hallett had been assured by the LFB management but it was a view not shared by a number of firefighters that had attended this incident, or expressed by a number of witnesses at the inquest (Interview with a LFB officer).

Disused mineshaft, Galston, Ayrshire, 2008

A member of the public fell into a disused mineshaft on the 25th July 2008 and subsequently died in the early hours of the following morning from hypothermia aggravated by her injuries from the fall. The casualty was lying approximately 14-15m from the surface where the 'plug' consisting of substantial pieces of material had come to rest in a 130m deep disused mineshaft. There was no way to confirm the stability of this plug or the depth of any remaining fall beneath it. Strathclyde FRS had line equipment that Strathclyde had conducted a risk assessment on and decided that it was not to be used for the rescue of members of the public, but restricted to the use of firefighters to ensure their safety when working at heights. This decision was reflected in their policy and procedural documents. Responsibility for line rescue had been delegated to other agencies. The issue for the FRS was the timeframe it took for these external specialist line-rescue resources to attend the incident. As the Chief Inspector for HMFSI (Scotland) stated in his report (Torrie, 2012, p3) "This was an unusual and particularly dangerous incident and was beyond the experience of any member of the emergency services who attended." In the Fatal Accident Inquiry (Leslie, 2011) the FRS SO present at the incident was asked regarding what operational discretion, was available to him in conducting his dynamic risk assessment if it should conflict with the FRS policy. His response was that he would comply with the policy and its procedures. The Sheriff concluded that reluctance to step outside of FRS procedures

was understandable due to the fear of prosecution should firefighters be injured or die as a result of not complying with FRS procedures.

Torrie (2012) states in his report to the Scottish Government that across the UK FRS personnel are finding themselves increasingly being faced with charges under Health and Safety legislation, which he acknowledges was affecting how FRSs were operating. This was particularly so regarding decision-making on the incident ground where it was evident that incident commanders were becoming more cautious. Following the conclusion of the Fatal Accident Inquiry the CFO of Strathclyde made public his comments in which he stated "fire-fighters are more fearful of health and safety legislation and the prospect of being prosecuted than of the dangers they face when saving lives… there is a real fear, a culture of fear, about potential for prosecution and litigation" (Safety & Health Practitioner, 2011).

Water related fatalities and incidents in 2012

The response of the FRSs at these water related incidents, whilst complying with their safe working practices, has not always been well-received by the members of the public or the media that the FRS is there to protect. Examples include the death of Simon Burgess in March 2012 when he drowned in a boating pond with a water depth of three feet following an epileptic seizure. Mr Burgess was face down in the water for 35 minutes before he was brought to the side of the lake by a Hampshire FRS specialist water team once it had arrived at the incident. The officer-in-charge of the first arriving FRS attendance followed his FRS procedure for such incidents and would not allow his personnel to enter the water and requested by radio the FRS specialist water team. The coroner did call upon the emergency services to re-examine their protocols in dealing with such situations (BBC News, 2012).

A similar incident occurred in Carshalton attended by the London Fire Brigade (LFB) involving a seagull in distress on another boating pond with a depth of three feet of water. The firefighters from five attending fire appliances were not allowed by their officers to enter the water. The LFB's response following the incident was that their priority "had been to protect the firemen and members of the public", with a LFB spokesman confirming "We are not willing to put the lives of our firefighters at risk for the sake of a seagull."" (Harding and Duell, 2012). Eventually a volunteer from an animal rescue centre donned some waders and rescued the seagull.

4.2.2 And "Damned if you don't… (comply with guidance)

Two Fire Fighters deaths at Gillender Street fire, 1991

There have been previous firefighter deaths over the years but one of the first to have a national impact in recent decades was the death of two firefighters, Firefighters Terrence Hunt and David Stokoe both stationed at Silvertown Fire Station, London Fire Brigade, at Hays Business Services Ltd., Gillender Street in London whilst attending a 20 pump fire in the East End of London on the 10th July 1991. In the LFB's internal Management Report (Butler and Whitty, 1991) there were 29 issues that were identified in the use of breathing apparatus and associated procedures including WB officers not being used as team leaders for breathing apparatus (BA) crews to provide the necessary leadership and supervision. There were a further 14 issues regarding Command and Control including specialist officers not undertaking the role they had been nominated to carry out; and the siting of fire appliances at the incident. Training had been highlighted over five issues which included:

- the role of Training Managers in producing appropriate training schedules agreed by the Station Commander;
- that training records and administrative procedures were not being complied with;
- the "lack of knowledge with regard to general procedures and practices" (p8);
- including the need for "operational personnel to have judgement and behaviour tested in a controlled training environment, to enable them to confidently deal with such operational incidents" (P8);
- training in heat, smoke and humidity "does not take place in a constructive manner. The training is inconsistent with regard to facilities, policy and procedures."

The LFB received two Improvement Notices following the Accident Investigation conducted by the HSE. In response the LFB produced two strategy documents, one for operational training (London Fire Brigade, 1993b) and a second document for health and safety (London Fire Brigade, 1993a).

Operational Training Strategy Document

The first of the two HSE Improvement Notices, LFB/1, related to the HSE findings in that "all reasonably practicable steps have not been taken to ensure that all personnel have received adequate training as required by section 2 (2) (c) of the Health and Safety at Work Act". Included with the Improvement Notice were a number of steps that were to be undertaken by the brigade. These included:

> "assessing the specific training needs of operational officers relating to the current operational standards; the training needs assessment should also include the content and realism of existing training and the methods of its delivery; the level of standards of operational competencies should be derived from the purposes of health and safety audit and review systems; and syllabuses for requisite training courses should be written or where syllabus exist, these should be revised" (London Fire Brigade, 1993ba, p2).

In the body of the document it emphasises the need to encourage individuals to take the initiative in the context of problem-solving at incidents however, two paragraphs later it informs us that management would have to change its expectations of which personnel, and in particular officers, would be knowledgeable of, and able to recall the depth of information available in Brigade Orders, SOPs (of which there were at one time over 300 such operational notes, many of 20-30 pages in length), general memoranda, the Drill Book, Manuals of Firemanship, Fire Service Circulars and the 'Dear Chief Officer Letters' from the Home Office (the central government office overseeing the Fire and Rescues Services in England at that time). The LFB acknowledged that the range of operational information was too extensive for staff to be able to remember and the possible variables at play at an incident too great to all be covered in procedural notes. A FRS's SOPs are referred to in some FRSs as their safe systems of work or standard operational procedures, each developed to comply with the HSE's demand for planning for foreseeable events. However, even in the early 1990's it was recognised, and specifically stated in this document (London Fire Brigade, 1993ba, p4), that "the complete reliance on such detailed prescriptions cannot however be regarded as entirely safe, not only because so many instructions exist but also because it may discourage personnel to think flexibly in a dangerous and often rapidly changing environment. It has also proved impossible to keep such a wide range of instructions updated in response to internally or externally required changes." This strategy document also strongly criticises the current continuation training of firefighters as being based on individual repetitive drills and on the creation of simple fire ground scenarios. The

authors of this document state that repetitive training is likely to be found boring and bear little relation to conditions on the fireground. In paragraph 7.2 (London Fire Brigade, 1993b, p9) it refers to the HSE Occupational Paper OP8 'Training for Hazardous Occupations: A case study of the Fire Service' (1984) in which it:

> "recognises that the activities which firefighters are required to perform can be frightening and unless they have experienced the fears which operational conditions can bring and have learnt to understand and control them, they may get into difficulties in hazardous circumstances and themselves be required to be rescued. They need to know from experience that officers will have considered their safety before committing them to a task and be confident that the task is within their capabilities… *[and that]* each of these aspects, control of fear and confidence in themselves, their colleagues and their officers can be developed in training… The importance of confidence in officers and colleagues cannot be overstated and as much practical training as possible should take place in the groups in which personnel will be working rather than by removing individuals from those groups to be trained." The Brigade's operational strategy document stated in para 9.4, p12 that "personnel should be transferred between stations… to give all staff the opportunity to gain experience and training at busy operational stations…"

In para 13.4, p15 (London Fire Brigade, 1993ba) the report authors raise questions regarding the recruitment of firefighters that will have the motivation and the ability to pass the examinations for the Sub Officer (Watch Manager 'A') and Station Officer (Watch Manager 'B') ranks. It states that there is the need to recruit those with the potential to progress to "station officer level and beyond." They recommended consideration be given to recruiting more candidates with GCSE or higher academic qualifications "without making this an absolute condition of employment", supported by the development of schemes to ensure able staff are promoted to the Station Officer rank within the minimum time of five years (as it was at that time). This is discussed further in the Discussion Chapter.

Health and Safety Strategy Document

The first paragraph of this document sets the tone, and one that will be familiar to all FRS operational personnel, in accentuating the focus of health and safety: "Organisations which are successful in achieving high standards of health and safety have health and safety policies" (p2). The next paragraph begins with "The priority is therefore to create an environment where, as far as reasonably practicable, our employees can be healthy and safe" (p2). The HSE schedule to the Improvement Notice LFB/2 required the following actions:

"Systems for effectively **monitoring and auditing**[3] the management of occupational health and safety within the London Fire Brigade should be devised and implemented. The systems should form part of or be linked to the Brigade's health and safety policy (GM 358). The policy should be revised and amended to include:-

Clear guidelines and instructions for departmental and area staff, including senior officers, line managers and supervisors to monitor **compliance** with operational standards recommended by the Home Office and standards of health and safety identified by the policy document GM 358. The guidelines should include requirements for the periodic assessment and recording of:-

(i) competence attainment levels at "operational procedures" and "command and control" levels;

(ii) State and suitability of equipment; and

(iii) any remedial action which is required.

A health and safety audit and review system operated by the Brigade's occupational health and safety professionals and/or other suitably competent and trained personnel. The system should form part of, be linked to or operate in parallel with the existing Operational and Performance Monitoring Team *[the Brigade's operational assurance team, Operational, Performance and Training Inspectorate (OPTI)]* set up following the Gillender Street double fatality."

In recognition of the limitations of FRS controls on the incident ground the strategy document stressed the importance of risk management and emphasised the importance of the concept of the 'safe person' rather than the 'safe workplace'; this reflects the concept of the 'hot' side of organisation away from the 'cold' side of the organisation. The strategy document (p5) identified within its process of risk management there were three stages of control:

- First stage controls: over human and physical resources (e.g. appliances and equipment);
- Second stage controls: over work activities taking place within the organisation **(the cold side of the organisation)**[4] with the objective of eliminating and minimising risks and creating a supportive organisation-wide safety culture;
- Third stage controls: over outputs to minimise risks outside the organisation arising from work activities and services **(the hot side of the organisation)**.

[3] Bold text is researcher's emphasis.

[4] Bold text is researcher's emphasis.

The authors had difficulty in deciding whether activities on the fireground should be placed under stage 2 or 3.

Six specialist actions were identified (p9) that needed to be undertaken which included the development of "an appropriate risk management system based on the concept of the 'safe person' and the completion of hazard and risk assessment for the full range of operational job roles"; "The development of operational and safety performance standards against which performance measurement and audit can take place"; and "the analysis of health and safety training needs the occupational groups and individuals and the development and delivery of the necessary training programs."

In the summary of this health and safety strategy document the London Fire Brigade summarises the Health and Safety Executive's document HSG65 including a diagram of the process titled 'Key elements of successful health and safety management". HSG65 was to become a commonly used model within UK FRSs not only for health and safety management but for general management as well (interview with a former HMFSI officer).

These two strategy documents have had a major impact on not only the London Fire Brigade but the UK FRS as a whole. From these two documents the FRS in England now have the nationally accepted Integrated Personal Development System (IPDS) which is based on individual competences and the use of role-maps; incident command; the introduction of the HSG65 audit process; and the Safe Person Concept. Many FRSs sought to establish their own operational assurance teams and most introduced their own health and safety sections, albeit of varying quality and resourced to different levels.

Sub Officer drowns in attempting a rescue, 1999

An On-Call Sub Officer[5] in the Greater Manchester Fire Service on the 5th September 1999 died whilst trying to rescue a boy who had disappeared below the surface of a lake at Simon's Lodge, Holcombe Brook, Greater Manchester (BBC News, 2002). This incident was of particular note for two reasons. The first reason was that the Deputy Chief Fire Officer of

[5] Sub Officer (SubO) was a rank used to denote the deputy officer-in-charge of a Watch at a station with multiple appliances of the officer-in-charge at a station with a single appliance. Since the modernisation of the FRS this rank now equates to either a Crew Manager of Watch Manager 'A' depending on the FRS.

the Greater Manchester Fire Service (GMFS) faced charges for gross negligent manslaughter and the GMFS, as an organisation, for corporate manslaughter. These charges were eventually dropped by the Crown Prosecution Service. Secondly, this incident was the catalyst for FRSs to begin to attempt to identify all the foreseeable operational activities that FRSs might be expected to have to undertake and encapsulating them in a series of additional operational procedures. Once it had been made clear that no legal proceedings were to be taken against the Deputy Chief Fire Officer he made a public announcement.

> "I don't think the HSE understands the specific problems which are faced by the emergency services of Great Britain. They seem to see the fire service is no different from someone that runs the corner shop. Yet we have situations where we have to respond to an emergency at 3 AM and our young men and women have to make life or death decisions. The HSE have to be realigned with the real world. Who is best placed to decide whether or not to attempt a rescue in the few seconds we have? A rulebook as the HSE wants, or a highly-trained, skilled and experienced firefighter, used to making swift decisions in unpredictable, emergency situations. When a mother, relative or other bystander is at the side of the River bank, screaming for the emergency services to do something, do we really expect crews to consult the rulebook as precious seconds tick away? Our methods and training saved on average 1000 lives a year without putting firefighters' lives at risk. A fire service driven by a rulebook will cost lives… The HSE expects specific and detailed procedures in place for every conceivable emergency. With the ever-increasing threats we face, particularly from terrorism, this is impossible. The government are seeking to make a statutory duty for the fire service to cover chemical, biological and radiological incidents and to respond to search and rescue incidents, including flooding on a large scale. The government has also said that it will not cost any more money – I believe that to be fundamentally flawed." (Manchester Evening News, 2004a).

At the Coroner's Court the officer who conducted the GMFS internal accident investigation stated that when the Sub Officer entered the water the boy had already been submerged below the surface of the water for 45 minutes and that the SubO was probably reacting to an expectation, and the resulting pressures being exerted, by members of the public to do something. This was acknowledged by the defending QC when he said that "there was an air of expectancy that the fire service should do something." (Manchester Evening News, 2004b). This incident influenced not only the GMFS but other FRSs, and particularly their POs, across the UK who were watching the outcome very closely. The Manchester Evening News reported "Fire chiefs believe a tough stance by the Health and Safety Executive regarding the safety of firefighters at work may cost lives. Fearful that the safety of crews might be at risk, commanders may be under pressure not to allow rescue attempts

especially at some 'special service' calls like floods or collapsed buildings." These are the same issues that affected the decision-making of the senior FRS officer in charge at the Galston mine incident. As we can see from these incidents, and there are others incidents to support this, if the members of the FRS are found not to have complied with safe systems of work written in SOPs then the FRA will be served Improvement Notices by the HSE which will reflect on the reputation and credibility of that FRA, and the FRS staff within the wider UK FRS. Depending on the outcomes of FRS actions then both the FRA and its staff face criminal prosecutions. It should be noted that the FBU had the totally opposite viewpoint believing the DCFO should have been found guilty of the charges.

Atherstone-on-Stour, 2007

Four members of the Warwickshire FRS died at a fire at Wealmoor (Atherstone) Ltd, Atherstone on Stour, Warwickshire on the 2nd November 2007. The HSE served an Improvement Notice on Warwickshire FRS under the Health and Safety at Work Act 1974 for having contravened the Management of Health and Safety at Work Regulations 1999 regarding risk assessments, health and safety arrangements, and information for employees (Sir Ken Knight. Chief Fire and Rescue Adviser, 2008). Subsequently, twelve officers were interviewed by Warwickshire Police under caution. One officer being interviewed under caution was the father of one the firefighter fatalities and had been the last person to speak to him before he entered the premises wearing breathing apparatus (BA). Three officers, all incident commanders in the early stages of the incident, were subsequently charged with manslaughter by gross negligence by the Crown Prosecution Service: all three were subsequently found not guilty. Warwickshire County Council (WCC), the FRA, however, was found guilty under Section 2 of the Health and Safety at Work Act 1974 for failing to provide as far as was reasonably practicable, for the health, safety and welfare of its employees and were fined £30,000.

Following this incident the FBU conducted its own accident investigation and published the report (Fire Brigades Union, 2008a) on its website. The key points the accident report made were categorised by the FBU as "a catalogue of organisational failings" including strategic planning; the Incident Command System (ICS); Dynamic Risk Assessments; and firefighting operations. The Fire Brigades Union accident report (2008a) highlighted that before 2003 FRSs were inspected by an external audit organisation, Her Majesty's Fire Service

Inspectorate, who would measure the performance of FRSs against a set of Best Value Performance Indicators, and the guidance provided within Fire Service Circulars, Dear Chief Officer Letters, and Fire Service Manuals. The report informs us that after 2003 these "controls were all but removed… (and FRSs) were given the freedom to set their own standards not only in terms of attendance at emergencies, but in terms of training, equipment, and a multitude of other things that were previously directed from the centre" (Fire Brigades Union, 2008a, p16). In regard to the ICS they concluded that 'operational intelligence', that is **information**[6] available to crews attending this incident regarding **hazards, risks, plans** and **water supplies** at the scene of the incident was poor. Conflicting information from the representative on site was not provided in a timely manner and at times could better be described as misinformation. FRS **communications** on the incident ground was ineffective which the FBU accident investigators judged as having led to information being lost and FRS personal self-deploying as opposed to being allocated tasks as part of a structured system of **command and control** which itself was not appropriately resourced. All of these issues are included in the Decision Making Model in section 4.3.4. The report informs us that following a number of previous incidents and the resulting legal cases, incident commanders are being left open to questions regarding their decision-making based on their risk assessments, and in particular their **dynamic risk assessments**. The question being asked is, are the risk assessments "suitable and sufficient to comply with their duties and provide legal protection for the organisation"? (Fire Brigades Union, 2008a, p18). At the Atherstone on Stour incident the FBU's accident investigators were concerned that for the majority of the decisions made there were no written records made of risk assessments made by the succession of incident commanders until the end of offensive operations.

The Honourable Mr Justice MacDuff (2012) produced his judgement and sentencing remarks regarding the case against WCC who are the FRA for Warwickshire FRS. In that judgement (2012, p2) he describes:

> "the proliferation of paper which has been generated in recent years both before and after the passing of the Fire and Rescue Service Act 2004. It has taken a lot of explanation from Mr Matthews QC, who has made himself an expert in the field of health and safety law, to educate me upon the statutory and regulatory framework which lies behind the huge volume of directives, and advisory notes, operational

[6] Text in bold are researcher's emphasis.

> procedures, and the many thousands of pages of other documents which we have had to consider in the course of this case. Little wonder that one of the witnesses in the case commented that he would like the firefighters' manual to be reduced to the size which it was a few years ago and to be made simpler. Can a firefighter, attending a fire in an emergency situation, remember what the picture on page 138 of the manual was intending to convey, how and when he should conduct his dynamic risk assessment, and which of the elements of the flowchart he should move between before forming his decisions? There are many obvious deficiencies in the paperwork. Many of the ever increasing numbers of directives and other papers are couched in language which borders on the impenetrable. We have found internal contradictions and entirely different flow charts purporting to show the same thing. In the course of the trial earlier this year, we spent much time debating what a particular directive or advisory note was intended to mean. There is no time for debate at the fire ground… The short point is this. It just seems to me that the confetti of regulatory and other advisory papers, intended to improve safe systems of working, is capable of being obfuscatory and counter-productive."

Mr Justice MacDuff also identified that the Warwickshire FRS did not blame the incident commanders for their decision to fight the fire offensively as they still believed it was the correct decision to have made. He spoke about the trained and experienced men who entered the incident as part of one of many BA teams who agreed with the decision and that there was only one person who disagreed with that decision. That person was an OC firefighter who had only recently qualified to use BA, and had never previously worn it at an incident, all of which suggests that this firefighter was relatively inexperienced and likely to have only recently joined the FRS. Mr Justice MacDuff concluded that the decision to commit BA crews was the correct decision in the circumstances on that night.

Comments were made regarding the Regulatory Reform (Fire Safety) Order 2005 (RRO) with which the respective owners had failed to comply with including critical fire protection measures and 'means of escape' from the premises. Prior to the introduction of the RRO each FRS was the enforcing authority regarding fire legislation. With its introduction this responsibility was transferred to the HSE. In the building in which the four firefighters died it was found that Building Control Regulations had been ignored; the intended sprinkler system was not in place, let alone functional; there was a lack of required fire-resisting material; the local authority and the Warwickshire FRS had not been informed of the work as was required. One could say that the HSE was at fault just as they were criticised for their inspection role at the site of the Marlie Farm prior to the fire and explosion that occurred involving fireworks and their mass storage (East Sussex Fire and Rescue Service, nd) in which two FRS employees were fatally injured. Mr Justice MacDuff found it perverse

that “by express statutory provision, the occupiers owed no duty to the deceased men. (p9)”. He then mentions how under previous fire safety legislation this duty had been precisely laid out in legislation.

The Chief Fire Officer of Warwickshire FRS and the President of the CFOA gave a press conference (Warwickshire Fire and Rescue Service, 2012) following the conclusion of the trial at which the three FRS incident commanders had been found not guilty by a jury. The CFOA President stated that every day firefighters and officers have to make risk-critical decisions and CFOA, representing all UK FRSs, were concerned “that prosecuting firefighters for manslaughter in this way will make firefighters overly risk averse. For this reason Warwickshire FRS and CFOA will be writing to the Home Secretary and the Justice Secretary to seek an investigation into how and why this investigation was allowed to proceed in this way.” What was the impact on Warwickshire FRS following this tragic incident? One interviewee from Warwickshire FRS, a PO, stated that Warwickshire had found the availability of OC staff had fallen from 100% to 70%; and there was now an issue of staff no longer being willing to act-up to the next rank to keep appliances ‘on-the-run’ i.e. available to attend calls. The FRS had found that the reason was related to the risk that individuals now felt exposed to of being subject to a ‘robust’ police investigation. They believed the small financial gain in payment was not sufficient to take the additional risk of having to make command decisions and then the possibility of having to go through the events that the three accused officers had been subjected to by the police. It was explained to the researcher that the three officers had faced potential 10 year sentences which would have meant loss of their permanent jobs (as they were OC staff), loss of any associated pensions, and potentially the breakup of their families; it was just not worth the risk. These comments were still prevalent some six years after the fire had occurred.

4.2.3 Some perspectives of key stakeholders

How health and safety law and practices were being perceived and applied was not just the concern of the English FRS but other industries as well. Lord Young was commissioned by central government to review and report to the Prime Minister on the operation of health and safety laws and the growth of the compensation culture (Young, 2010). He stated that “none of my recommendations applies to hazardous occupations where the present system, although probably overly bureaucratic is nevertheless effective in reducing

accidents at work." This raises the question as to what does he define as hazardous occupations: does that just refer to those industries where the handling and use of hazardous substances is carried out routinely every day, or does he include the FRS operational activities within his use of the term? As one FRS PO stated in his interview:

> "Health and safety law, as it was originally drafted, was drafted really for industrial environments where high-risk and hazardous processes were operating. It wasn't necessarily at that time envisaged to be entirely translatable and suitable to a dynamic environment involving risks. But the point is that that risk *(associated with operational firefighting and rescue operations)* is not static, and it's not neutral risk, by which I mean it's not just that this presents a risk to you engaging with it, it is actually that that risk presents a hazard to people who may be involved and you are responsible to for saving lives or to intervene to protect. There is a requirement to expose yourself to the risk in order to do the job that society is paying you to do."

Lord Young attributes the perception of the 'absurd application' of health and safety rules, and the fear of a compensation culture, to being partly attributed to European Directives such as the Framework Directive 1989. This required and made compulsory risk assessments across all occupations and how that had been taken up so enthusiastically by health and safety consultants, some of whom may have lacked the appropriate qualifications and experience. Their response was to attempt to eradicate all potential risk rather than adopting the approach of being reasonably practical as outlined in the Health and Safety at Work Act 1974.

Not long after making available its document 'Striking the Balance' the HSE issued further guidance, 'Heroism in the fire and rescue service' (Health and Safety Executive, n.d.-a). This provided guidance, in the circumstances of FRS operational activities, as to how the HSE endorsed the recommendation made by Lord Young (2010) in that "individual firefighters should not be at risk of investigation or prosecution, under health and safety law, if they have put themselves at risk as a result of a heroic act." (Health and Safety Executive, n.d.-a, p1). This HSE guidance refers to the previous HSE document 'Striking the Balance' which it says made it clear "that fire and rescue services need to manage all foreseeable risk effectively". It also highlights the duty of firefighters to "act sensibly and responsibly within the command and control of their employer; they should not act recklessly." The HSE believes a firefighter is being heroic when the decision to act is their own with no orders or directions from SOs, and in order to protect the public or their colleagues and that those actions do not put other firefighters at similar high risk. The HSE in its next paragraph does

stress the importance of command and control discipline to ensure firefighter safety yet advocates firefighters acting outside of the command and control structure. The responsible SO may have to explain why those firefighters were allowed to operate 'unsafely' without adequate supervision and control.

In 2011 the FBU wrote a letter (Dark, 2011b) to the then CFRA, Sir Ken Knight, which highlighted the concerns of the FBU regarding public and firefighter safety. These concerns included the need for guidance from a national body to provide leadership, guidance and instruction so as to improve firefighter safety; the provision of safe systems of work; to create or appoint a new external body of knowledgeable, and competent people to audit operational and service delivery provided by the FRS. Dark referred to the FBU report 'In the Line of Duty' (2008b) which researched the deaths of twenty-two firefighters between 2003 and 2008 and found that, despite the change programme of modernisation of the FRS, poor risk assessment, inadequate policies and procedures, and inadequate provision of training, and assessment of competence continued to be consistent contributory factors. In regard to operational audit and scrutiny of the FRS the FBU in their report 'Falling to the lowest common denominator' (2010) stated that the Audit Commission's report 'Rising to the Challenge' (2008) provided sufficient evidence to demonstrate the Audit Commission did not have the specific knowledge or experience required, particularly in relation to FRSs being focussed on risk assessment, to inspect operational fire and rescue services over that same period as firefighter fatalities were occurring.

The Letter from Dark to the CFRA (2011b) also refers to the HSE's report (2010a) following their inspections of eight FRSs in Great Britain. At the time of the publication of the report the HSE was still involved in, or had recently completed, the accident investigations of six fires at which FRS personnel had died whilst engaged in firefighting operations. The HSE found that FRSs had not been inspected for some years, following the re-roling and then the demise of the HMFSI, as part of a proactive programme of inspections despite there having been a large number of firefighter fatalities at operational incidents. They were also concerned at what appeared to be issues around the competence of staff and the level of supervision for firefighters. The HSE believed that there was a further issue regarding whether OC firefighters were able to fulfil the duties of a firefighter based on the limited time available for training. The authors of the HSE report (2010a) stated that the risks associated with larger fires have proved to be a common factor in previous incidents at

which there had been one or more firefighter deaths. The FRSs that the HSE had inspected for this report attributed part of the problem as being due to the reduced number of such incidents and consequently the reduced number of opportunities to gain experience in fighting fires in larger structures and the specific risks associated with them. FRSs had raised concerns regarding their ability to replicate these conditions and circumstances and to incorporate them to provide realistic and effective training to compensate for the lost opportunities to gain the necessary experience on the incident ground. These last two points the HSE intended to include as contextual factors for any future HSE investigations or interventions with the FRS.

The FBU's concern over the increase in firefighter deaths, at fires during a time when fire deaths for members of the public were reducing, led them to commissioning a briefing paper for Members of Parliament (Watterson, 2013). In the paper's summary Watterson (2013, p1) identified that "good practice that exists has periodically been ignored… lessons slowly learnt, communication and information stifled, by lengthy legal wrangles creating a justice deficit and by organisational denials of accountability." Dekker (2007; 2012) uses the term a 'just culture' to reflect the opposite of a 'blame culture' or 'justice deficit'. Under the subject of justice deficit Watterson highlights that rarely do fatal accident reports include any acknowledgement of the direct and indirect roles of central and local governments, FRS directors, and senior managers have had in the incubation period of latent conditions that may have contributed to the death of a firefighter. In his key recommendations Watterson highlights the need for an appropriately funded body that would conduct audits and inspections of FRSs with particular regard to the safety of both the community and firefighters; this body would also make available the key findings and subsequent guidance following firefighter fatalities; the production of fire, and health and safety documentation; to inspect FRSs and ensure they had acted on Rule 43 letters from coroners. These were all duties once the responsibility of HMFSI which the Bain et al. (2002) report was the catalyst for setting in motion its demise, and subsequently the introduction of a process of self-regulation and peer group assessments. Watterson concluded that the 'self-regulation' model for use by local authorities, i.e. peer-group reviews, which had been introduced by central government at the beginning of the 21st century, should be abandoned as it has overseen a rise in firefighter deaths. Watterson sees this new body as being either part of the CFRA office or, as has occurred in Scotland, the reintroduction of HMFSI. He highlights that the key point is that this body should be independent although he doesn't outline

independent from whom: should this be central government, local government, CFOA, or any combination of the three?

Watterson (2013) did identify that firefighters were experiencing problems with the Analytical Risk Assessments (ARA) but did not elaborate on what those problems were. ARA will be discussed later in section 4.3.3. Watterson recommended that the use of ARA's and the role of the 'Safety Officer'[7] should be reviewed. He did recommend the use of Monitoring Officers at incidents. A number of recent fires at which there were firefighter fatalities are then outlined, each highlighting failures that may have contributed to those deaths. Across those fatal incidents there are some consistent factors that keep arising such as risk information, training, equipment, weight of attack, attendance times, risk assessments, planning, communications, briefings, command and control, and experience.

Watterson concluded that firefighter safety had appeared to have been side-tracked as a priority within a number of FRSs whose focus was now on value for money and retrenchment. He stated that several FRSs had "repeatedly and across the UK failed to implement existing legislation and follow guidance adequately" despite the current "oversight and scrutiny by central and local government and inspection and legislation by HSE" all of which were in a position to highlight these failures (Watterson, 2013, p38). As an example, in the section relating to the death of a Greater Manchester FRS (GMFRS) firefighter in 2013 he highlights that in modelling the integrated risk for the period 2013/2014, the GMFRS covered community safety and addressed value for money but did not explicitly address the safety of firefighters. In the GMFRS corporate plan for 2013-2016, which includes its Integrated Risk Management Plan[8] (IRMP), Watterson identified there were no references to firefighter safety. In support of Watterson's view regarding prioritisation, one interviewee for this research also highlighted that in the draft CFOA business plan for 2009-2010, two years after the four firefighter deaths in Warwickshire FRS, that none of CFOA's original set of annual objectives, themes, or corporate risks were related to firefighter safety; the focus was instead on other issues that CFOA had prioritised, and in particular meeting the central government's agenda on equality and

[7] A Safety Officer is appointed by the incident or sector commander. The person should be suitably qualified and of appropriate experience. More often than not it is a firefighter that is delegated this role at smaller incidents.

[8] IRMP is effectively, and in simple terms, a plan to determine the size of the demand on the FRS and the scale and location of its resources to meet that demand.

diversity. This oversight was dealt with before the final publication once it had been raised by an external consultant but it does provide an indication of how, in some quarters, the issue of firefighter safety has not been prioritised during a period in which firefighter fatalities has raised some major concerns.

Penton et al. (2013) were commissioned by the Fire Protection Association (FPA) to conduct research into four English and one Welsh FRSs. Interviewees in this thesis research indicated that the FPA initiated their research due to their concerns that, whilst acknowledging the benefits of modernisation including a reduction in the number of fires and fire fatalities, why were fire losses increasing, and why was there no corresponding reduction in firefighter deaths? The research conducted by Penton et al. was deductive research with a working hypothesis of "health and safety management policies and guidance may lead to constraints in the decision-making behaviour of FRS staff." (p7). It would seem, based on their selection of quotations, the majority of their interviewees were either in the roles of senior or principal officers. In their findings Penton et al. observed a gap between senior management and station-based personnel, and between that which was theoretically supposed to be happening and what was actually occurring. As a result of both internal and external factors, both managers and staff thought their ability to engage in intuitive thinking on the incident ground and to innovate when required had been removed from them. Documents intended to provide clarity regarding the conduct of operations have in reality restricted the actions they were allowed to take. Penton et al. also found that FRS documentation produced two responses from operational staff. The first was to adapt those SOPs based on their experience or alternatively, and as an extreme reaction, to do nothing for the lack of clarity as to what actions they could take. Which response was chosen appeared to be associated with the level of experience of individuals in decision-making roles. What was clear is there is a concern regarding the impending loss of experience as staff become eligible for retirement. In the climate of potential prosecution hanging over the heads of FRSs for actions taken on the incident ground Penton et al. found that staff believed that the purpose of producing safe systems of work was to protect the organisation in the form of a box ticking exercise in case they should be inspected or investigated. It was these FRS health and safety policies that were thought to be responsible for what staff believed was a process that was de-skilling them and that there was a blame culture in operation. Operating outside of SOPs had caused some consternation and a dilemma for SOs as to whether they should congratulate and reward

staff for their successful and heroic actions, or should be punished for their non-compliance. The view from the incident ground was that if their FRS would not support them then it was safer to do nothing, suggesting issues of clarity, trust and confidence between them and their senior management. Penton et al. found that issues regarding recruit selection, promotion, and leadership attracted similar views and comments from both watch based staff and senior management when questioned.

4.3 Guidance on incident command, risk assessments, and decision making

4.3.1 Incident Command

Incident Command was introduced in detail to the FRS with the first version of the Fire Service Manual, Incident Command (Her Majesty's Fire Service Inspectorate, 1999a) followed by editions 2 (2002), and finally edition 3 (2008). Prior to the first edition the FRS had used a mnemonic to act as cues for what to consider in decision-making. The Incident Command Manual was superseded in late 2015 and incident command was included in the guidance provided by the National Operational Guidance Programme established by the LGA and CFOA (2015a). This guidance describes incident command as providing:

> "the incident commander with a clear framework to structure, organise and manage an incident. It can be adapted to all sizes and types of incident and will help them deploy and utilise resources in an efficient and safe way. The incident command system allows the incident commander to use health and safety arrangements, including standard operational procedures tailored to the characteristics of an emergency… This helps the incident commander to achieve an appropriate balance between the benefit of undertaking planned actions and the risks associated with them."

From the first edition of the Incident Command manual for the Fire Services (Her Majesty's Fire Service Inspectorate, 1999b) and all subsequent editions up to and including the new Incident Command guidance (Chief Fire Officers Association, 2015a) there has been reference to the use of the term 'Tactical Mode'. This term indicates whilst at an incident, based on an evaluation of hazard and risk, whether operational activities would be in an offensive, defensive or transitional mode of operations. The Offensive mode indicated that a higher level of risk exposure would be accepted as FRS personnel took offensive action such as internal firefighting with jets, or the carrying out of rescues. Defensive mode would be adopted where typically the risks outweighed the potential benefits despite any control

measures that might be implemented. In practical terms the Defensive mode involves external firefighting with the use of covering or monitor jets to prevent fire spread externally. By declaring the mode in operation it was also intended to heighten the awareness of FRS personnel on the incident ground that their actions could have a knock-on effect on the safety of other firefighters.

Despite the use of an incident command system there have been some issues related to ensuring it is adequately resourced. This relates to the number of flexible-duty officer posts that have been lost in some FRSs following decisions to make cost savings in line with austerity cuts. The result is that there are fewer officers available to provide the tactical incident command skills as incident and subordinate commanders which in turn increase the burden and levels of stress on the remaining officers. Therefore, the FBU at its 2013 Conference (Fire Brigades Union, 2013b) decided to adopt a proposal relating to the reduction of flexible-duty officer posts and to challenge the FRAs and the FRSs involved in their decisions.

4.3.2 Leadership

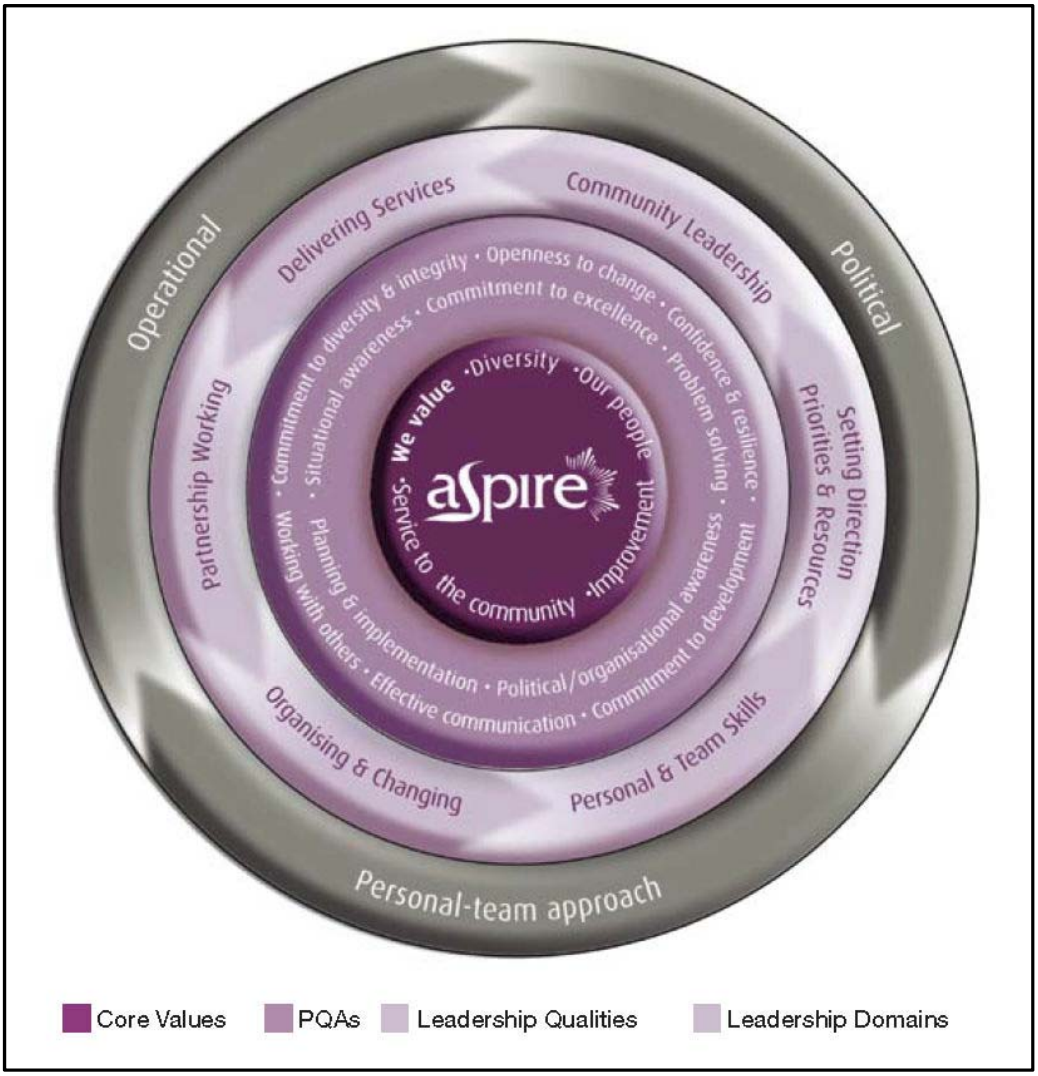
The FSC previously taught leadership using John Adair's (1988) model of leadership consisting of three circles. These were task needs, individual needs, and group needs based on his work with the military. Adair's model of leadership was included in edition 1 of the Incident Command Manual (Her Majesty's Fire Service Inspectorate, 1999b) and retained in edition 2 (Her Majesty's Fire Service Inspectorate, 2002). The Incident Command manual recognised that in emergencies the leadership style was more likely to be directive and autocratic rather than consultative.

Bain et al. (2002) expressed the view that to implement the required changes to modernise the fire service there would also have to be changes at SO levels in the future. They believed that SOs would benefit from training in general and personnel management so as to broaden their expertise, and by increasing the level of external training. They also recommended that greater use should be made of resources external to the FRS by recruiting a proportion of its officers from outside the FRS. Bain et al. (2002, p viii) saw the Fire Service College (FSC) as the centre to "provide the focus for developing new thinking required for the Fire Service." The Centre for Leadership was established at the FSC by

stakeholder groups but primarily the LGA and CFOA and this was where the Aspire model of leadership was developed and used to launch the change to transformational leadership within the English FRS in 2007. The Aspire model is shown in Figure 4-2.

As can be seen in the outer ring of the model there are three domains of leadership: political, operational, and personal-team approach. These three domains are associated with local government, operations, and teams. The centre circle represents the FRS core values and the next outer ring the personal quality attributes (PQAs) of the individual.

Figure 4-2. The Aspire model of leadership.



Source: Incident Command Manual (Her Majesty's Fire Service Inspectorate, 2008)

In the final edition of the Incident Command manual (Her Majesty's Fire Service Inspectorate, 2008) the Aspire model of leadership replaced that of Adair's model. Now

that the Incident Command manual has in turn been replaced by the Incident Command document (Chief Fire Officers Association, 2015a) and The Foundation for Incident Command (Chief Fire Officers Association, 2015b) the Aspire model has been removed and instead the Incident Command guidance now refers to using 'the most appropriate leadership behaviours' (Chief Fire Officers Association, 2015b, p8). Both documents refer to the importance that leadership plays in bringing an incident to a successful conclusion, and that the people they are in charge of, other organisations present, and members of the public will expect the commander to display calmness, be confident, decisive and professional. The commander is expected to inspire the confidence of others, not just in the commander but in themselves; with confidence comes trust. The adoption of the appropriate leadership style we are advised is dependent on:

- The level of **risk**[9]
- How **fast** the incident is developing
- The **type** of incident
- The **competence** of the team
- The **experience** of the team

CFOA (2015b, p9)

The Foundation document raises the subject of the supervision of personnel on the incident ground and when personnel are exposed to higher levels of risk then there is a greater need for adequate supervision at the different levels associated with incident command, delegated tasks, and the control of teams.

Two-Tier entry and accelerated promotion courses

With the comments made in the Bain Report (2002) regarding FRS leadership and the need to recruit a proportion of its officers from outside the FRS a number of FRAs have made changes to how potential officers are recruited and selected. The London Fire Brigade has adopted a two-tier entry system where university graduates are fast-tracked from the point

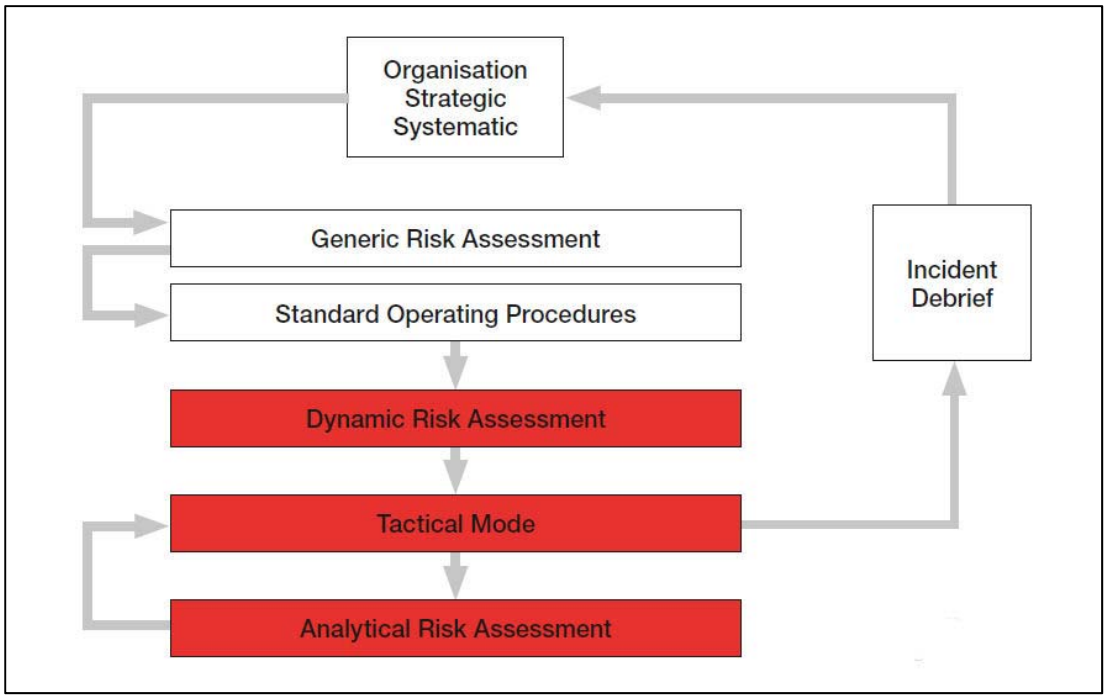
[9] The bold text is the researcher's emphasis.

of joining the LFB through the supervisory ranks to the point at which they become middle managers in the role of a station manager. Their role will include operations and taking charge of incidents. The LFEPA deliberately chose not to specify the degrees or classes of degree required of potential applicants when advertising. One interviewee pointed out this decision was likely to have been based on grounds of equal opportunities in that it might negatively impact on recruiting from under-represented groups.

4.3.3 Risk assessments

Within the last edition of the Incident Command manual (Her Majesty's Fire Service Inspectorate, 2008) a figure is provided to show the key elements associated with risk assessments and Standard Operating Procedures are related to one another which continues to remain relevant. This is shown in Figure 4-3.

Figure 4-3. Relations between types of risk assessments and SOPs.



Source: Her Majesty's Fire Service Inspectorate (2008)

Strategic Risk Assessments (SRA)

By conducting a SRA a FRA can identify the appropriate control measures to reduce FRS risk to a level that is as low as is reasonably practicable. The Framework document expects that

these controls might consist of structured training, suitable equipment including personal protective equipment, access to operational risk information, procedural guidance and a safe system of work (SOPs). Other organisations may associate the SRA, in the context of their own organisation, with conducting a PESTLE review in which political, economic, social, technical, legal, and environmental risks are identified.

The CLG (2013) published a document the short title of which is 'Framework', and it is intended to assist FRAs in balancing risks particularly in regard to meeting their duties regarding the protection of lives and property. The Framework's focus is on the planning and delivery of safe systems of work and the safe person principles in the operational and training environments of the FRS. This takes into account the HSE documents Striking the Balance (2010b) and Heroism in the fire and rescue service (n.d.-a). Amongst the guiding principles of the Framework, it identifies the following principles pertinent to this research with key words highlighted in bold type for emphasis by the researcher:

- The **personal responsibilities** of individuals are clear and health, safety and welfare is embedded into all activities and not seen as separate

- The **scrutiny** of the health, safety and welfare management system must be an identified function of the fire authority as the primary employer

- Well-established management and **incident command arrangements** are in place for controlling the operational risks to firefighters

- **Appropriate resources** are made available to ensure a high standard of safety management, incident command and the integration of good health, safety and welfare management within operational and business decisions

- Provision of **high quality training** to ensure all personnel are competent to perform their roles and to make appropriate operational decisions

- **Monitoring** safety performance and incident command based on both leading and lagging indicators is central to ensuring the operational risks are being effectively managed

- Ensuring internal standards and safe operational procedures aim to be **optimise the balance between risks and benefits** – which does not mean avoiding risks but managing them responsibly on the basis of likelihood and severity

Source: (Communities and Local Government, 2013, p9)

The Framework document (Communities and Local Government, 2009) outlines what it terms as the four pillars of operational risk assessment which are:

- Strategic risk assessment
- Generic hazard and risk statements
- Dynamic/incident risk assessment
- Individual risk assessment

Generic Risk Assessments (GRA)

The purpose of the GRA, of which there are currently thirty-six such GRAs published by the CLG, is to provide a risk assessment in a consistent way, producing consistent outcomes for the wide range of incidents a FRS may have to attend. The process of completing a GRA requires the inclusion of the action to "implement control measures to reduce the risk" and then lists those "Control measures for FRSs which will inevitably involve some or all of the following:"

- Standard operating procedures
- Operational equipment
- Personal protective equipment
- Realistic training and exercise commensurate with the organisation's identified risks
- Competence
- Communications
- Levels of supervision

Source: (Communities and Local Government, 2009)

It can be seen here the importance placed in ensuring the safety of a firefighter at operational incidents based on SOPs; realistic training; competence; communications; and levels of supervision. The Framework document informs users that these GRAs do not replace the requirement for a local authority to have conducted its own risk assessment under HSE legislation in regard to foreseeable risk that their staff and others under their control might be exposed to (Communities and Local Government, 2013; Gough, 2013; Chief Fire Officers Association, 2015b). To meet this requirement FRAs are expected to conduct their own strategic risk assessments for this purpose.

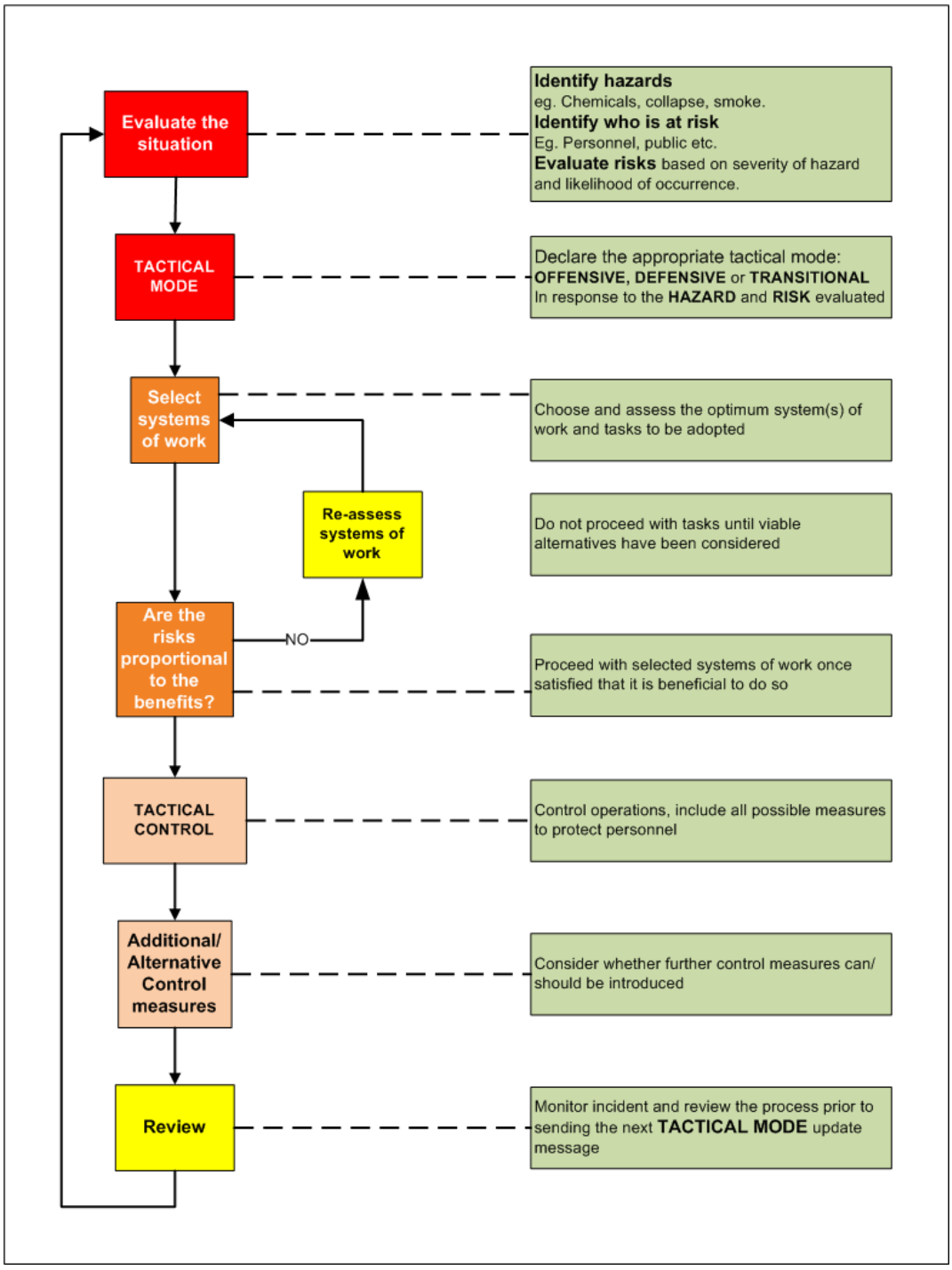
Dynamic Risk Assessments (DRA)

The CLG defines a DRA as being used by an incident commander where hazards and their associated risks within the dynamic environment of an incident are identified. It will take into account information based on site-specific premises risk information; SOPs; observation of the circumstances of the incident; and information available from eye witnesses at the scene. The incident commander's priority is the same as in general approaches to risk management in that the focus is on the safety of persons, equipment, and the environment at risk. A safe working environment is achieved by putting in place the appropriate controls based on a balance between risk and benefits, i.e. risk mitigation.

The Home Office, the Government Department overseeing the FRS at the time, produced a document titled 'Dynamic management of risk at operational incidents' '(Home Office, 1998, p2) which defined dynamic risk management as "The continuous process of identifying hazards, assessing risk, taking action to eliminate or reduce risk, monitoring and reviewing, in the rapidly changing circumstances of an operational incident". Each member of the FRS, including firefighters received a personal copy of this document. The process of conducting a Dynamic Risk Assessment (DRA) consists of the following actions shown in Figure 4-4.

In all three editions of the Incident Command Manual they include reference to conducting Dynamic Risk Assessments (DRA).

Figure 4-4. Example of the Dynamic Risk Assessment flowchart.



Source: Communities and Local Government (2013)

The 3rd edition (2008, p67) describes DRA as being a process of continuous risk assessment "in a rapidly changing environment" during which the incident commander has to make decisions:

“before a complete appreciation of all the material facts has been obtained… In a high-risk, low time environment the incident commander must implement greater levels of control and apply appropriate control measures, in order to reduce risk to an acceptable level. Only then can crews be committed into the hazard area…. A DRA must be reviewed and continuously updated as required.”

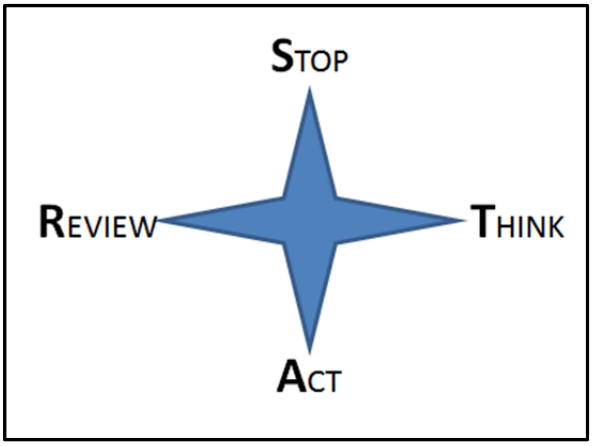
Analytical Risk Assessments (ARA)

Conducting ARAs on the incident ground was first introduced in the second edition of the FRS Incident Command manual (Her Majesty's Fire Service Inspectorate, 2002) in which it showed a risk matrix of 8 x 8 cells. In its last edition, (Her Majesty's Fire Service Inspectorate, 2008), the risk matrix was reduced to 5 x 5 cells. The manual stressed the importance of recording the outcome of a risk assessment that would reflect the time at which risk-based assessments, and by implication decisions, were made. Both editions referred to an ARA being conducted as soon as resources became available and used to confirm the DRA phase by utilising a more in-depth analytical form of risk assessment. This ARA would either confirm the DRA or it would identify a requirement to change the tactical mode of operations.

Individual risk assessment

The final form of risk assessment is the individual risk assessment (IRA). This is seen as another layer of risk management designed for use when “unsupervised firefighters may encounter an unexpected or unforeseen situation” (Communities and Local Government, 2013, p23). It is a simple risk management process to raise awareness of hazards and risk to influence their risk-taking behaviour. Figure 4-5 represents a model with which to conduct an individual risk assessment included in the Framework document and in use with the West Midlands FRS. This model highlights the need for individuals to stop, think about their intended actions, and then review the outcomes.

Figure 4-5. The STAR model for making individual risk assessments in the FRS.



Source: Communities and Local Government (2013)

4.3.4 Models to aid in decision-making

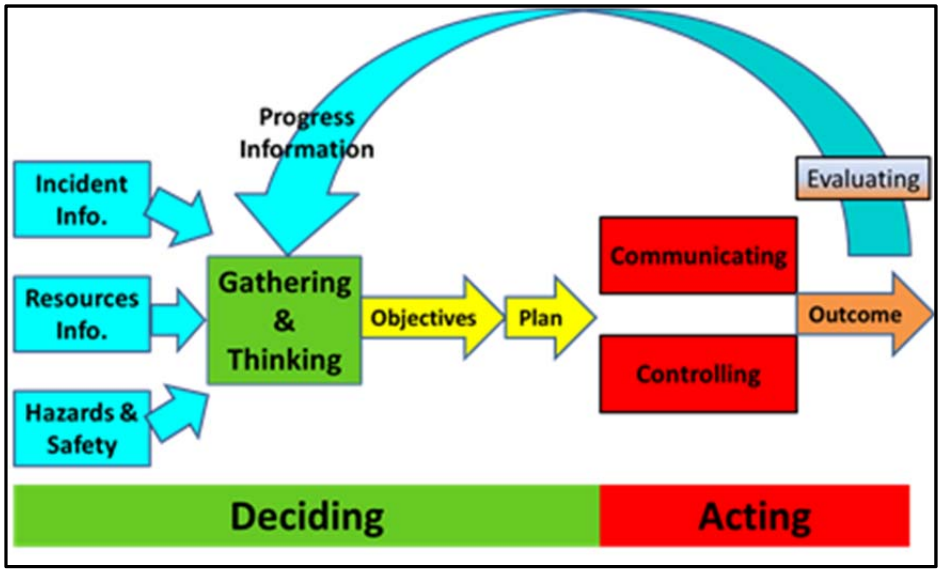
There are currently three decision-making models being used within the FRS. The first is the Decision Making Model (DMM); the second being the Decision Control Process (DCP) model, formerly called the Fire Decision Model in its draft documentation; and the final model is the Joint Emergency Services Interoperability (JESIP) Decision Making Model. This has led to some confusion within the FRS, and the researcher was asked twice during the research fieldwork phase by SOs for advice as to which model they should be using. Each model is discussed in the following paragraphs.

Decision Making Model (DMM)

The final edition of the Incident Command manual acknowledged that "experienced officers have reported the value they have derived from the Decision Making Model developed by the London Fire Brigade" which it categorises as a "cyclical model, not unlike a Deming 'Plan, Do, Check, Action' cycle… which may assist commanders in achieving their operational activities. An obvious application is in the analytical phase of the risk assessment." (Her Majesty's Fire Service Inspectorate, 2008, p17). The DMM was included in Appendix 4 of the manual as an example and the diagram of the DMM was repeated a total of 14 times across as many pages. It was thought that it would be placed in the main body of the text in any further editions of the Incident Command manual. At this point the researcher should declare an interest in this decision-making model as he was part of the

team of members of the LFB that devised this model. The team was led by the LFB's organisational psychologist who subsequently wrote about the model in his paper (Burke, 1997) on competence in command in the London Fire Brigade. This paper was subsequently referred to in Flin (1996) on her research into decision-making. The team included the administrator for the LFB assurance team, the OTPI; two officers whose function in the LFB was to build the rolemaps so their interest was how the model could be incorporated into the role of incident command; and three officers representing the three Commands within the LFB having been selected for their incident command experience. The DMM was originally called the Incident Command Model (ICM) but it was taken by the LFB's assurance team (OTPI) to the project management team within the LFB who appreciated the value of the ICM outside the environment of operations, and in the day to day decision-making of staff at all levels. It was therefore renamed the DMM to incorporate its use in both operational and non-operational functions within the LFB. The DMM in shown in Figure 4-6.

Figure 4-6. The London Fire Brigade's Decision Making Model.



Source: The London Fire Brigade

The DMM can be divided into two parts: the DECIDING and the ACTING phases. In the deciding phase the decision-maker gathers and weighs up the available information based on the incident (situation), the available resources, and the hazards and levels of safety required based on the outcomes of the DRA. From this information the decision-maker then identifies the objectives and prioritises them and forms a plan as to how they are to be achieved and the outcomes (or milestones) that were expected to be achieved. Having

decided the plan the decision-maker then needs to identify those people and organisations that need to know the parts of the plan relevant to their activities and to communicate with them. Having communicated the plan the decision maker then needs to control the activities to make sure they conform to the plan and make the most efficient and effective use of allocated resources. As the outcomes are achieved, or if there were issues in achieving them, they would form part of the evaluation process which would then feed into the Gathering and Thinking stage of the DECIDING phase. Within the LFB, where the DMM originated, the intention was that uniformed officers would be introduced at later stages to the use of heuristics and biases associated with decision-making.

The DMM was linked to the operational Rolemaps through the work led by the two Personnel and Training officers who had assisted in developing the DMM. Appendix XXXX shows how one FRS used the DMM to score GM candidates on their operational assessment for promotion.

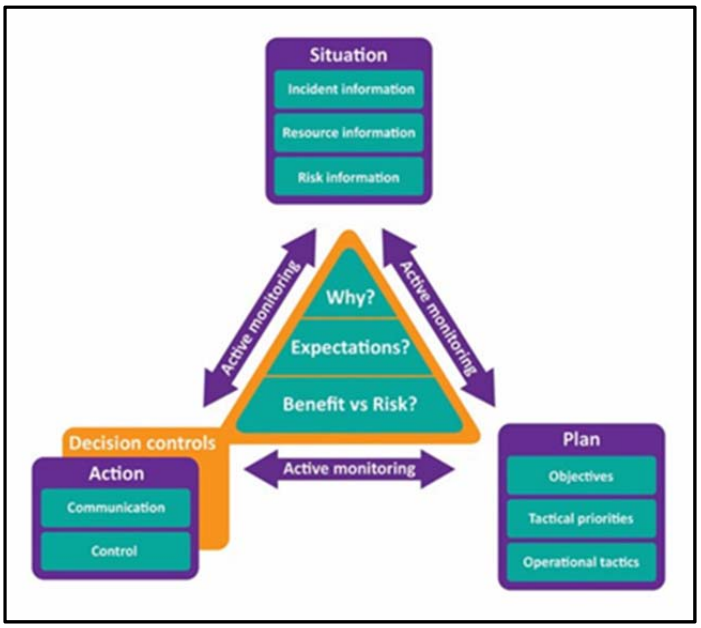
Decision Control Process (DCP)

The DCP is outlined in two documents, The Foundation for Incident Command (Chief Fire Officers Association, 2015b) and the guidance on Incident Command in a joint publication by the CLG, CFOA, and the LFB (National Operational Guidance Programme, n.d.). This is a model described as taking into account the natural decision processes that an individual might use in the context of an incident attended by the FRS and in dynamic situations involving intuitive decision-making as well as those incidents that allow more analytical decisions to be made. The DCP is shown in Figure 4-7. The CFOA document states that "Evidence from incidents shows that decisions are not always made in a linear way as represented in previous decision-making models", i.e. the DMM (Chief Fire Officers Association, 2015b, p27).

The DCP is intended to assist the individual to avoid the consequences of 'decision traps'. The process is scalable in that it can be used for small incidents up to and including major incidents. The DCP can also be used with the Joint Decision Model at incidents involving other emergency services and agencies. The model is divided into four stages: situation, plan, decision controls, and action.

The first stage, situation, refers to situational awareness built on an assessment of the current situation, the contributory factors leading to the situation, and how it might continue to develop. The second stage is to develop a plan to deal with the situation which should include prioritised objectives and the tactics by which it can be achieved. These tactics would include which SOPs to use and where necessary what 'operational discretions' could be allowed in implementing them; how the objectives are to be achieved, by whom, using what resources; where will this happen; what are the expectations and; when are they likely to be achieved. The third stage is that of using decision controls to avoid indecision.

Figure 4-7. The Decision Control Process.



Source: CFOA (2015a; b)

The final and fourth stage is the action stage in which the decision is implemented and includes communicating to others details in the form of instructions, risk-critical information, and providing updates. This stage also includes controlling the implementation of the decision which may require actions and tasks to be delegated to nominated persons.

The Joint Decision Model (JDM)

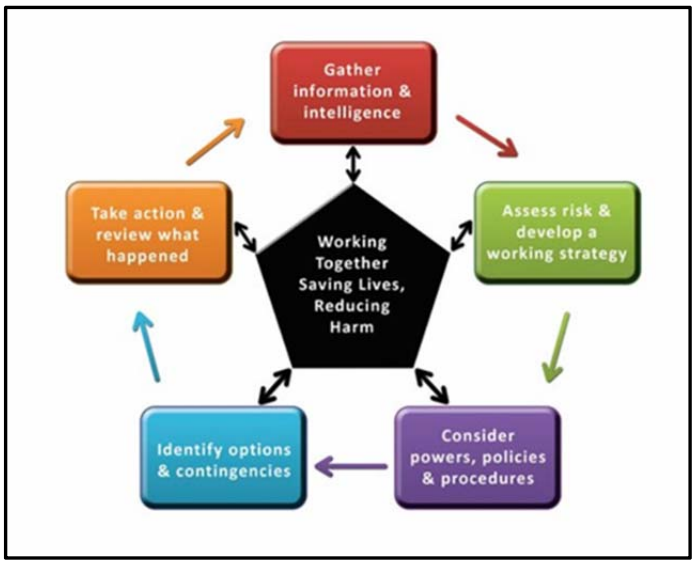
The final decision model is that of the Joint Emergency Services Interoperability Programme's (JESIP) Joint Decision Model (2014). This was the result of work conducted by

the JESIP Programme, whose Interoperability Board is chaired by a CFOA member, and was focussed on improving how the emergency services worked together at the scene of major incidents in what are termed multi-agency incidents. The Programme's work was completed in 2014. The JDM decision making model is included in the JESIP (2014) Interoperability Framework document and is a scalable model that can be used in any environment requiring a joint emergency service attendance. The model itself is based on three primary considerations:

- **Situation**: what is happening, what are the impacts, the risks, what might happen and what is being done about it
- **Direction**: prioritised aims and objectives
- **Action**: what needs to be done to achieve the desired outcomes.

The JESIP acknowledges the range of decision models that are available and being used within the emergency services and places an emphasis on the need that decision making models should not be over complicated. Other key points are that in using the JDM decision makers should be given freedom, based on their judgement and experience as to how they interpret the model and apply it in light of the circumstances they face. The implication is that the model is there for guidance and not blind compliance as the outcomes are the primary focus. The JDM is shown in Figure 4-8.

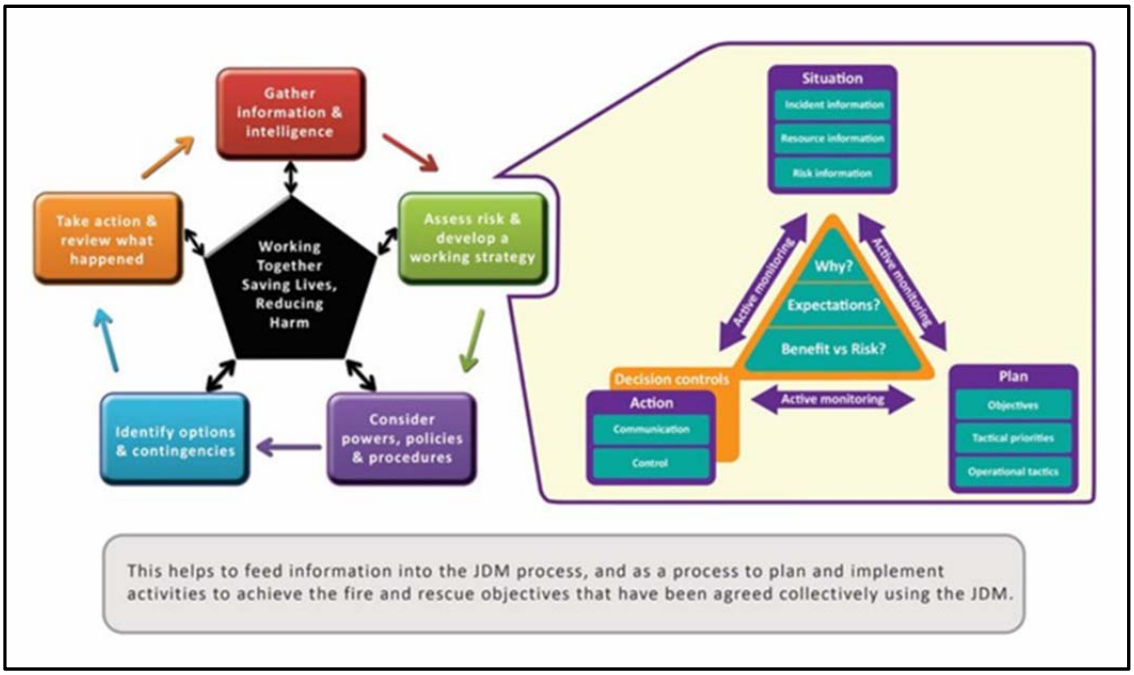
Figure 4-8. The JESIP model of Joint Decision Making.



Source: Joint Emergency Services Interoperability Programme (2014)

Figure 4-9 shows how the FRS's DCP model of decision making fits with the JDM as shown in the CFOA document on the foundation of incident command (Chief Fire Officers Association, 2015b).

Figure 4-9. How the National Operational Guidance Programme aligns the Decision Control Process with the JESIP Joint Decision Model.



Source: Chief Fire Officers Association (2015b)

4.3.5 Operational Assurance: Monitoring, Audit and Reviews

The terms monitoring, review, and audit are now familiar terms used extensively within FRS documentation. Review and audit came into widespread FRS use following the publication of the HSE's document HSG65 (1991) followed by a second edition (1997). In these editions the FRS were introduced to the HSE's POPMAR model which consisted of six elements, the last three of which were 'measuring performance', 'reviewing performance', and 'auditing'. This was adopted as the model for audits within the LFB by both their operational assurance team and their health and safety section, and has been used by other FRSs for the same purpose.

In measuring, or monitoring, performance the HSG65 refers to two systems being required. The first is an active system which effectively monitors inputs, and a reactive system which monitors outputs; these are closely associated with the terms leading and lagging performance indicators.

Monitoring Officers

In 2008 the third and final edition of the Incident Command manual was produced in which it mentions the role of a more senior officer to the incident commander on the incident ground who can adopt either a mentoring role with a less experienced incident commander, or that of a monitoring role. The monitoring role was first established by the LFB following criticisms made of it following the major fire at Kings Cross in 1987, based on the rapid changeover of incident commanders as the fire escalated. These officers were being forced into making decisions without the benefit of the knowledge of previous plans and decisions. The principle was that a Monitoring Officer would be mobilised so that if the incident escalated to the level that required the next level of commander that officer would already be present and have an understanding of the situation to enable them to take charge and make informed decisions. If the Monitoring Officer was not required to take charge of the incident then this officer would be in a position to monitor the use of SOPs, their effectiveness, and the competence of crews.

Audit

HSG65 (Health and Safety Executive, 1997) likens health and safety audits to those audits more familiar to organisations such as financial, environmental, and quality audits all of which have their own standards. This document informs us that the use of the term 'audit'[10] by some organisations may in reality refer to monitoring or inspection activities but the HSE defines audit as: "The structured process of collecting independent information on the efficiency, effectiveness and reliability of the total health and safety management system and drawing up plans for corrective action" (Health and Safety Executive, 1997, p68). The Institute of Internal Auditors (IIA) (2011) defines internal audit as:

> "Internal auditing is an independent, objective assurance and consulting activity designed to add value and improve an organisation's operations. It helps an organisation

[10] Across the FRS the term 'assurance' has been used rather than 'audit' as it was thought to be less threatening to FRS staff.

accomplish its objectives by bringing a systematic, disciplined approach to evaluate and improve the effectiveness of risk management, control and governance processes."

The key point in both definitions is the use of the term 'independent', and 'objective'. Independence is required to ensure the internal audit is conducted in an unbiased manner without being affected by internal organisational pressures. Objectivity refers to auditors not allowing their objectivity to be subordinated by others. The IIA informs us that threats to independence and objectivity need to be managed at the levels of the internal auditor, the audit engagement, functional and organisational levels.

The HSG65 (1997) has now been superseded by a new document titled Managing for health and safety (Health and Safety Executive, 2013). This version still includes mention of measuring performance and reviewing performance but the role of audit is no longer referred to. In regard to conducting reviews it does highlight the need for those undertaking reviews to "have the necessary training, experience and good judgement to achieve competence in this task" (Health and Safety Executive, 2013, p56). In the push to achieve savings, internal audit functions have been one of the first functions to be disbanded or replaced by a low level system of self-monitoring within FRSs. Sagan (1993) highlighted that there are issues with self-reporting, and by inference, self-regulation, just as the financial industry discovered to their own and the UK's cost, with individuals and teams being reluctant to highlight their own faults.

Reason (1997) categorises systems within an organisation to be either focused on production or protection. To remove integral parts of the safety system such as audit functions must be viewed as detrimental to the production systems and their operators unless there is a replacement system that is equally effective.

Reviews

The HSE guidance HSG65 identifies the process of reviewing as occurring at different levels within an organisation conducted by first-line supervisors and managers in order to remedy issues of sub-standard performance. From this we can determine that an audit is conducted by auditors that are independent and objective, i.e. not biased, of the area that they will audit; whereas reviewing an area is undertaken by the 'owners' or operators of the system so as to improve performance of those processes and systems.

4.4 Competence

The Framework document (Communities and Local Government, 2009) acknowledges that the biggest challenge to a FRA is how it will ensure the maintenance of competence of its workforce.

To achieve this aim of developing a competent workforce the English FRSs have adopted The Integrated Personal Development System (IPDS) developed from the LFB's Integrated Management and Development Programme (IMDP) and is based on the competence of the individual. The IMDP was an outcome that addressed one of the requirements of the HSE Improvement Notices served on the LFB following the fatal fire at Gillender Street. As a number of FRSs in the UK became involved in competence training it was re-branded the IPDS. Bain et al. (2002, p70) made mention of it and how it provides a national framework of skills and competences based on roles. They wanted to see the IPDS expanded beyond just FRS operational personnel to include FRS support staff.

In providing and ensuring trained personnel, and following on from the previous work of individual FRSs, as recognised in the Bain Report (2002), UK FRSs have adopted a set of National Occupational Standards (NOS) related to a set of Rolemaps based on the seven roles within a FRS. Appendix 4-1 highlights the seven roles within a FRS and provides a brief outline of each based on the information provided by the Skills for Justice – Career Pathways (Skills for Justice, n.d.). The NOS are described as:

> "National Occupational Standards (NOS) described competent performance in terms of outcomes of an individual's work and the knowledge and skills they need to perform effectively. They allow a clear assessment of competence against nationally agreed standards of performance, across a range of workplace circumstances for roles. In this way, defining what has to be achieved, rather than what has to be done; they provide the necessary flexibility to meet the needs of individuals… NOS (National Occupational Standards) underpin the national fire and rescue service role maps, agreed by local government employers/National joint Council (LGE/NJC). The fire service's integrated personal development system (IPDS) has developed role maps, supported by National occupational standards (NOS), for all roles within the UK fire service. The IPDS enables fire and rescue services to train and develop their staff to meet the changing demands that face the service. It also enables individuals to assess their development needs against a set of National occupational standards and seek appropriate training and development opportunities."

IPDS utilises both the NOS and Rolemaps is described by CFOA (Chief Fire Officers Association, 2010)as providing:

> "a structure, based on agreed standards of performance, within which organisations can identify, attract, assess and develop people to fulfil their current and future roles. This framework is designed to support the needs of the Integrated Risk Management Plan (IRMP), the promotion of equality of opportunity for every person and a focus on improving the health and safety of staff".

The FBU has been a supporter of the introduction and implementation of IPDS but has been critical of the level and quality of resources that have been allocated to provide the necessary training to ensure individual competence. In 2008, following the worst year for firefighter deaths in recent years, the FBU (2008b) produced a report focussing on firefighter deaths from which they identified inadequate training as having been a contributory causal factor across these incidents. In the same year the FBU commissioned a poll, conducted by YouGov, with WT and OC firefighters (Fire Brigades Union, 2008c). It identified that:

- 53% of firefighters believed their training in the previous 12 months had been less than adequate (59% of Wholetime and 51% On-Call firefighters).
- when asked had the quantity and quality of the training improved over the previous 12 months 59% did not believe it had (71% of WT and 55% of OC firefighters).
- was inadequate or insufficient training compromising firefighter safety? (80% believed it had to a degree whilst 37% thought it had strongly affected firefighter safety).

Breathing apparatus was an issue for firefighters in that only 35% had received specialist breathing apparatus training in the previous 12 months and only 24% had received refresher breathing apparatus training. A similar lack of training provision was found in regard to hot fire and fire behaviour training with 36% not having received it in the previous 12 months, and for 36% of those that did it consisted of less than four hours. Training in the use of DRA had only been made available to 34% of firefighters and for 18% of those who did receive training it consisted of watching a DVD.

Training exercises normally consist of two to four pumping appliances and any required specialist appliances. These may be either within the boundaries of a FRS site, such as a station or training centre, or alternatively they may be carried out off-site with the

assistance of participating companies and organisations external to the FRS. Training exercises can be viewed as the culmination of individual competence training, whilst operating in a team environment, in the selection of the appropriate procedures and their ability to implement them in a coordinated manner. Inter-service exercises test the ability of the various services and local authorities to operate together in a coordinated fashion. In large scale exercises with more than four pumps or inter-service exercises the focus is primarily on the senior officers and their ability to command or support the incident commander whilst operating in specialist functions. The YouGov poll found that only 27% of FRS personnel had participated in a large-scale exercise in the previous twelve months.

Chapter 5 Analysis of the Survey Questionnaires and Factor Analysis

In developing the questionnaire the purpose was to identify what safety culture, as a concept, meant in real terms to English firefighters and their officers and what were its constituent factors or dimensions.

Bryman and Cramer (1997) inform us that a factor brings together a number of similar characteristics and that with the use of factor analysis we can identify those factors. Oppenheim (1992) explains the use of factor analysis as being a method by which we can determine the underlying factors, or dimensions, explaining the correlations from a set of responses. The process assists in reducing the data so as to determine a smaller number of factors that capture the majority of the variance found within a larger set of factors and from which we can identify the dimensions of the concept of interest. Factor analysis identifies the variation which is shared between recorded scores on three or more factors and is referred to as being the common variance. The unique variance is made of specific variance relating to variation that is unique to a specific factor, and the error variance which is always present when conducting measurements. It is the inability to differentiate between specific and error variance that leads to them being combined into unique variance. The total variance that can be found in the scores consists of the common variance and the unique variance. It is the variance of a test that we seek to explain that is referred to as its communality. Bryman and Cramer (1997) highlight factor analysis as a technique to assess the degree to which items are tapping the same concept, that is the factorial validity of the statements and the degree to which they are measuring the same concept; determining the level to which the set of items can be reduced whilst explaining the highest level of variance; and finally, to make sense of complex human behaviour by identifying the key factors behind it. A factor analysis consists of two stages, the first being the principal components analysis (PCA) followed by principal-axis factoring analysis (PAF) which is sometimes also referred to as factor analysis. SPSS reserves the term factor analysis to describe the combination of both the PCA and the PAF (Bryman and Cramer (1997). What differentiates PCA and PAF is how they treat unique variance. Using PCA we include the total variance in the analysis and make the assumption that the test is both reliable and contains no errors. When using the PAF we only include the common variance

shared by the tests in the analysis which seeks to exclude the unique variance. From this the variance, which we seek to explain, is referred to as being the communality (Bryman and Cramer, 1997). The use of factor analysis in this research is of an exploratory nature in that it will be used to examine the relationships between the different variables (Bryman & Cramer, 1997).

Correlation matrix

Before conducting a factor analysis a correlation matrix was produced using SPSS with each cell representing the significance level. The datasheet can be used to look for high and low correlations between responses as if there are no correlations present it informs us that the items are unrelated and unlikely to form one or more factors. Bryman and Cramer (1997) inform us that if there are no significant correlations, then conducting a factor analysis would not be appropriate. Should a correlation coefficient be less than a 0.05 probability level then that item may be associated with more than one factor. Coolican (2004) advises us that it is best to remove items with the lowest item-total correlations.

Before proceeding with the factor analysis two further tests were conducted. The first was related to the sampling adequacy, and the second to test whether the correlation matrix is an identity matrix. The sampling adequacy can be ascertained by conducting a Kaiser-Meyer-Olkin test which compares the size of the correlation coefficients with the partial correlation coefficients. If the Kaiser-Meyer-Olkin test statistic is below 0.5 a factor analysis is not appropriate. In this test the statistic was over this figure with a value of 0.756. In the Bartlett's test of sphericity the significance value should be less than 0.05, this was achieved with a significance value of 0.000 was achieved and therefore this criterion was met. Using SPSS the results are shown in Table 5-1.

Table 5-1. Results for Kaiser-Meyer-Olkin and Bartlett's tests.

KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.756
Bartlett's Test of Sphericity	Approx. Chi-Square	1896.804
	df	780
	Sig.	.000

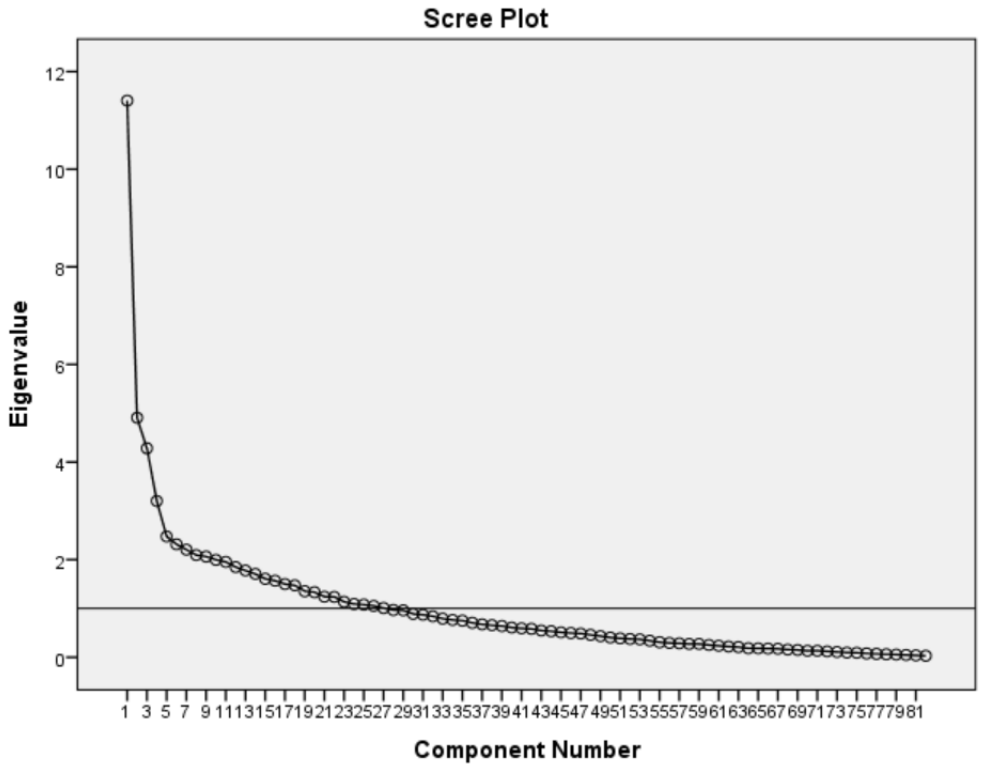
Principal component analysis of the correlation matrix

A principal component analysis is the first stage of conducting a factor analysis. Using the correlation matrix we are seeking to identify those factors which account for as much as possible of the correlation. These factors will be analysed and subsequently be named intuitively based on the meanings that can be derived from the items that cluster together within each factor.

As part of the SPSS output the eigenvalues are produced for each principal component. The larger the eigenvalue the greater the amount of total variance that factor accounts for. Those eigenvalues with a value of less than one are excluded. Using this Kaiser criterion there are 25 potential factors remaining from the pool of 82.

By graphically displaying these eigenvalues in what is termed a Cattell scree plot we can identify visually those factors that should be included. Figure 5-1 is a scree plot based on the data from the principal components analysis.

Figure 5-1. Cattell scree plot using the data from the pilot study.



From this scree plot we can determine that there are four factors that stand out from the scree, or noise, formed by the remaining factors. All four are above the eigenvalue of 1. This identifies there are four principal factors arising from the analysis of pilot data. The aim is to now identify those items that contribute to each factor and then to label each factor according to the meaning we can derive from the items identified from the output associated with the factor loadings.

By using SPSS to conduct a principal components analysis a table was derived based on the four factors identified via their eigenvalues and the scree plot. The rotated factor loadings and communalities table are not easy to interpret (Kinnear and Gray, 2000). The values of the factor loadings are the correlation coefficients between the variables in the factors. When reviewing this data the higher the value of the loading then the greater the factor accounts for the total variance of scores of the variable concerned (Kinnear and Gray, 2000).

The rotated factor loadings and communalities table lists the factor loadings based on a transformation of the variance from the correlation matrix using varimax orthogonal rotation into a format making it easier to understand and interpret by increasing the loadings on some of the items. This form of rotation is commonly used when a single factor is inadequate to capture the meaning of the data and multiple factors are required (Rust, 1999). However, Oppenheim (1992) informs us that it may still be difficult to determine and interpret the factors. Those variables that have a correlation of less than 0.3 with a factor can be removed because they account for only a very small proportion of the variance (Bryan and Cramer, 1997; Kinnear and Gray, 2000; Coolican, 2004). To determine which variable, or item, relates to which factor we look at the size of the value in each row ignoring whether it is a positive or negative value. The greater the value indicates which factor that variable should be associated with. Some variables may have the same, or nearly the same, high value for more than one factor in which case the researcher has to look closely at that variable and determine which factor it is more readily associated with.

The labelling of the potential factors has been a continuous process of reiteration throughout the research and was informed in the early stages of the research by those dimensions identified in previous safety culture surveys, both professional and academic,

including those of Flin et al. (2000) who identified in their study the factors, or dimensions, as being management, procedures, safety systems, risk, work pressure, and competence.

Figure 3-2, in chapter 3, shows the potential components that the researcher initially believed might arise during the research during the first stage of analysing the comments made by Watch based staff and officers when discussing what safety culture meant in the context of the FRS. The researcher recognised the labelling of the components would be led by the collected data and its analysis, and ultimately, the subjective interpretation of the researcher.

Table 5-2 shows the rotated component matrix for the four factors and their associated statements, from the survey questionnaire. Each set of statements, under their respective factor, were then discussed with the key informants, representing each of the three FRS role groups, as to how that factor might be labelled. Comparing some of the statements within a factor proved relatively easy as they had a common word in each, such as 'management' or 'procedures'. Other statements did not have the shared key word but an analysis of the statement, in the context of the other statements within that factor, one could infer the use of that key word. All key informants used the term 'FRS' and 'management' interchangeably, and particularly so amongst WB staff where the term 'management', within their everyday language, would be used to refer to officers as being agents of the FRS. Although there were a number of discussions over some statements and alternative meanings were investigated, there was a general consensus achieved in describing factors 1 to 4 as representing Management, Procedures, Competence, and Work Pressure respectively. There were some issues in early attempts to label the last factor, particularly in relation to the three role groups of POs, SOs, and WB staff. With a larger set of items the common theme, or pattern, appeared to be around objectives but this was not a good fit with all of the items in this fourth factor. However, Guldenmund (2007) had identified that safety culture factors should also be viewed hierarchically within an organisation such as the Organisational level; the Group level; and at the Individual level. This difference in objectives at the three role groups levels could be incorporated into the term work pressures, which Flin et al. (2000) had already identified in their work. The process of eliminating statements in the item analysis reduced the number to four for this factor which had the effect of reducing the size of this issue and reinforcing the appropriateness of labelling this factor 'work pressure'. Flin et al. (2000) included these four

factors and added safety system, and risk as additional factors in their research into the oil-industry, the fire and rescue service and later the medical professions. The researcher revisited the scree plot and there were potentially additional factors present due to the number of factors with eigenvalues greater than 1. The SPSS procedure for data reduction was re-run for both five and six factors. The six factors produced sets of items that were not internally consistent with one another. However, the additional factor, when testing for five factors, did contain a number of statements using the word 'safety' but in analysing the statements it was clear that the key focus in those statements was around the role of management in regard to safety. Therefore a fifth factor of 'safety' was not included in this research. The term 'risk' was included in three of the original statements as part of the pilot study but only one survived the factorial analysis and was then removed following the item analysis process.

The text in the square brackets in some of the statements in Table 5-2 have been added by the researcher following the analysis phase to assist the reader in following the logic as to why those factors were labelled as they were under each factor. The next stage was to look at the contribution to variance by all the variables in each factor and reduce the number of variables so as only those with a strong contribution remain.

Rotated Component Matrix[a]

	Component		
	1	2	
Q27	0.792		When a firefighter or officer reports a safety problem, management acts quickly to correct safety issues.
Q3	0.737		Management acts decisively when a safety concern is raised.
Q6	0.699		Management is receptive to learning about safety concerns raised by operational staff.
Q33	0.645		There is good communication in my FRS [from management] about safety issues which affect me.
Q19	0.620		Promoting operational safety is a high priority for management in my fire and rescue service.
Q5	0.584		All officers and station-based personnel are made aware [by management] of the lessons learned from accidents to operational staff at incidents attended by my FRS.
Q21	0.582		Management is willing to invest time, money and effort to improve operational safety.
Q30	0.572		The priority for my fire and rescue service [management] is the safety of firefighters on the incident ground.
Q18	0.562		I believe my FRS's [management's] operational policies and procedures are up-to-date.
Q23	0.506	0.379	My FRS's [management] health and safety reporting system enables me to report lapses in safety that take place on the incident ground without fear of retribution or of being ridiculed.
Q10	0.485	0.353	My fire and rescue service [management] is active in seeking to reduce risks to firefighters on the incident ground.
Q20	0.419		If I raise health and safety issues with my line manager they will be dealt with.
Q22	0.390		I believe that safety issues relating to firefighters on the incident ground are assigned a high priority within my FRS [by management].
Q35	0.308	0.616	Operational procedures are just a way of covering manager's backs.
Q36		0.597	Firefighters and officers who admit their errors [in applying procedures] are making a career mistake.
Q26		0.578	Senior officers are stopping firefighters from carrying out their job because of health and safety concerns [procedures to be complied with].
Q15		0.574	The promotion system [and its procedures] produces managers, not leaders.
Q29	0.323	0.570	[Procedurally] Accident investigations are mainly used to identify who is to blame.
Q31		0.566	Sometimes it is necessary to depart from safe working practices and procedures at operational incidents.
Q13		0.555	Management emphasis is on preventing fires at the expense of maintaining operational competency [in using operational procedures].
Q32		0.535	There isn't time to look at operational procedure documents or their summaries when I am on the incident ground.
Q24		0.532	Time that used to be scheduled for operational training [in use of procedures] is now used on community safety initiatives.
Q12	0.317	0.484	I feel that I can influence how health and safety [procedures are] is implemented in my FRS.
Q3		0.474	It would be best to remain anonymous when reporting an unsafe condition or near miss [because the procedure is part of the blame culture].
Q1		0.469	Sometimes the need for a quick response at an incident means I don't have enough time to get the job done as required in operational procedures.
Q9		0.433	Having lots of safe working systems [and their procedures] in place reduces the likelihood of an accident.
Q2		0.424	Operational procedure documents are so long and detailed it is difficult to remember each one of them on the incident ground.
Q25		0.416	[The procedure for] Reporting accidents or near misses that occurred on the incident ground is a bureaucratic procedure taking more time than it's worth.

Table 5-2. Rotated Component Matrix for each variable under their associated factor.

Rotated Component Matrix[a]

	Component		
	3	4	
Q5R	0.620		Staff are generally not familiar [and therefore competent] with all operational procedures.
Q65	0.586		I am confident the colleagues I am likely to have to work with on the incident ground are competent in their operational role.
Q16	0.520		Learning opportunities are affected by individuals seeking to deflect blame on actions they were responsible for. [competence]
Q9	-0.504	-0.367	Colleagues do not always recognise when a 'near miss' has occurred. [competence]
Q28	0.484		Operational staff are encouraged to raise safety concerns whilst at an incident. [perceived competence of staff]
Q43R	0.471		On the incident ground commanders will turn a blind eye to some safety issues if it means getting the job done. [Trust in staff being competent]
Q11	0.457		I get no feedback as to whether I have been working safely or not. [feedback on competence]
Q7	0.438		Operational officers often fail to recognise when operational staff are acting unsafely. [competence]
Q14		0.703	It is difficult to find the time to practice all of the many operational procedures. [work pressure]
Q43R		0.589	I have sufficient time available to ensure my competence in applying operational procedures. [work pressure]
Q17		0.492	There are not enough resources, including time, for a FRS to train for every situation it might be called upon to attend. [work pressure]
Q34	0.306	0.442	The level of training is not sufficient to make up for the loss of experience from attending fewer incidents. [work pressure]

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.[a]

a. Rotation converged in 6 iterations.

5.1 Reliability and the internal validity of the test scale

Reliability of a scale is a prerequisite to its validity and if it has a high level of validity it will then also be reliable (Oppenheim, 1992). Reliability provides the means to assess its consistency as a measuring instrument in scoring using the underlying scale variable. In searching for increased consistency, the aim is to reduce those errors that can lead to inconsistency and the reliability of the instrument. Oppenheim informs us that the reliability of an instrument can be measured in a number of ways. The method chosen for this research is the use of what Oppenheim describes as the internal consistency method which requires the use of the Cronbach Alpha coefficient to determine which items in the test have a strong relationship, i.e. correlation, with the scale and with each other, which indicates an increased likelihood the items are measuring the same homogenous variable. The Cronbach Alpha coefficient provides an estimate in regard to the level of total variance that is not due to error and it is this value that is used to determine the reliability of the scale. In simple terms the Cronbach Alpha assesses how well the test items measure the same construct they were designed to measure; if the responses to these items are internally consistent then we can determine that the items are measuring the same construct. Using the Cronbach Alpha coefficient we can identify the highest level of the coefficient we can achieve with the minimum number of items which will contribute the most to the instruments reliability. The value of the Cronbach Alpha coefficient should be 0.7 or above to show a strong correlation (Oppenheim, 1992; Howitt and Cramer, 2000; Kinnear and Gray, 2000; Pallant, 2001). Oppenheim (1992) informs us that rarely will we find a Cronbach Alpha coefficient that exceeds 0.9. If it falls below this value of 0.7 then there is evidence that there is too much error in the Factor which may be attributable to one or more of the items measuring the Factor. By removing items we can investigate whether we can improve the Cronbach Alpha coefficient and which items should remain. An item analysis was made using the original 147 cases from which 6 had been removed due to the questionnaires not having be properly completed, and during the tests a further 9 cases were excluded as part of the listwise deletion process based on all variables in the item analysis procedure. With five cycles of reiteration of the procedure a Cronbach's Alpha coefficient of 0.892 was achieved with 36 items being retained.

Having 'streamlined' the questionnaire to include the most relevant items and increase its internal validity we are left with a questionnaire consisting of 36 items with an additional

13 demographic items. These were renumbered randomly and checked to ensure there were an approximate equal number of positive and negative items.

5.1.1 Validity

Face validity

Oppenheim (1992) believes that there are dangers in using face validity when it consists of only an examination of the items contained within the questionnaire and can affect any subsequent generalisations we might wish to make from the results. Coolican (2004, p193) informs us that a test will have face validity if it "is obvious what it is measuring". He refers to Kline (2000) who informs us that face validity has strength when it motivates the respondents belief that there is value in completing the test. Oppenheim also includes in the face validity the format and design of the questionnaire.

Content validity

Two academic members of staff with experience in developing and using questionnaires were invited to qualitatively assess the questionnaire looking for whether the questions were sufficiently broad enough so as to cover the subject area and whether there was undue weighting or potential for bias in some of the subject areas. This content validity had also been conducted by the researcher's key informants, two senior officers who had previously conducted their academic research projects, and a small number of WB staff. The results of the group exit-interviews were also used to feed into this process. Rust (1999) informs us that content validity is generally incorporated into the process of item analysis.

Concurrent validity

Other safety culture questionnaires that were available were reviewed and compared. The factors identified by the pilot study, management, procedures, competence, and work pressures, indicate there is a close alignment to the work of Flin et al. (2000). Oppenheim informs us that if it becomes difficult to make comparisons with external criterion then it places a greater emphasis on the use of content validity and the reliability of the measures constituting the test instrument. The safety culture survey questionnaire developed in this research has identified the use of four factors that are similar to that used by Flin et al.

(2000); has achieved a Cronbach's Alpha coefficient score of 0.892; and had been accepted in the process of content validity.

Construct validity

This was assessed as part of the factor analysis.

Bias

Item bias relates to the language used in constructing the test which may include the use of double-negatives and issues regarding religion, racism, and gender (Rust, 1999). These issues were dealt with during the development of the items and in subsequent testing of the test instrument.

5.1.2 Planned analysis of the collected data

This is a descriptive case study that adopts as its general strategy the use of theoretical propositions derived from the survey instrument on safety culture. The use of the theoretical propositions will guide how the case study will be analysed; how it will highlight the contextual environment in which FRSs find themselves; and determine the potential explanations (Yin, 2014).

The technique being adopted for analysing the data is cross-case synthesis in which each embedded unit of analysis (i.e. a FRS) is treated as a separate study leading to the findings of each case being aggregated and used to reflect the findings for the case study in an analytic generalisation. The data from each unit of analysis will be incorporated into a series of tables, each associated with a single dimension of the safety culture concept. It is expected that an ongoing process of reviewing these tables and their data will lead to additional tables being added based on new categories or features. These tables will then be used to identify patterns of similarity, the differences and ambiguities between the participating FRSs using a qualitative analysis from which cross-case conclusions will be drawn of the participating FRSs

Using factor analysis four sub-concepts, or dimensions, were identified. These are management, procedures, competence, and work pressures. The four dimensions have been used throughout the remainder of this and later Chapters to provide a theme to assist

in negotiating each of those Chapters. The items in the questionnaire were then used to explore the following objectives:

1. To describe the overall pattern of responses for all of the five participating FRSs for each of the four safety culture dimensions and the concept of safety culture itself.

2. To identify and describe any differences between each of the FRSs across the four safety culture dimensions and the concept of safety culture itself.

3. To identify and describe any differences between the three subcultures identified by Schein (2010) and their FRS equivalent, that of the executive (principal officers), the designer (senior officers), and the operators (WB staff) across the safety culture concept and its dimensions.

Most statistical reference books include reference to the sensitivity of parametric tests to four basic assumptions (Field, 2000): the data should either be based on a continuous scale, or at least at the interval level with equal distance between the points on that scale; the data should be independent in that the behaviour of one subject does not influence another; the homogeneity of variance between groups should not change systematically throughout the data; and the data should be normally distributed. In the analysis of the data in this research the view of Tabachnick and Fidell (2014) has been adopted when they inform us that parametric tests are robust enough to withstand violation of the assumptions of a normal distribution particularly in regard to skewness and kurtosis. A transformation of the data may sufficiently change a non-normal distribution of the data to bring it within the bounds of a normal distribution. However, transforming data that does not strongly violate the assumptions of normality can induce a new distribution that still violates, albeit in a different direction, than that of a normal distribution. Tabachnick and Fidell (2014) recommend that when using large samples we should make a decision based on a visual inspection of the shape of the distribution rather than by using inference tests, as the latter have a tendency to reject the null hypothesis based on relatively minor deviations from normality. Then there is the issue of outliers in the data: these might be drawn towards the mean of the distribution as a by-product of a transformation of the data. The alternative is to amend the values of the outliers so that they are no longer outside the range of the boxplot's maximum and minimum values so as to reduce their

impact. Tabachnick and Fidell (2014) inform us that in non-experimental research it is typical to find that there are unequal group sizes such as in this research where there is a range of different types of FRSs, both large and small, that affects the number of subjects. There are also three role groups in which the total numbers within those roles differ considerably. When the groups are of unequal sizes Bryant and Cramer (1997) suggest that non-parametric tests should be conducted. Howell (2002) informs us that by a slight amendment to the formula used by the ANOVA process unequal group sizes can be accommodated. In the debates as to when one should, or should not, use parametric tests Field (2000) suggests using both parametric and non-parametric tests together and then comparing the results. For the purposes of this research outliers, once checked to ensure they are not the result of an error in the data entry, have had their values amended. Both non-parametric tests and parametric tests have been used and as Field suggests, with the findings of the parametric tests have been reported if supported by the findings of the non-parametric tests. Otherwise the non-parametric findings have been reported. The non-parametric test results for the first dimension of the safety culture concept: management has been included in the body of the text.

5.1.3 A brief description of the five participating FRSs

The following is a brief summary description of each FRS without providing too much detail that might inadvertently identify one or more of the participating FRSs.

FRS 1 is a small county type FRS with an extensive rural area managing a small core of WT staff and a larger number of OC staff. This FRS has a relatively small number of stations and fire appliances with which to cover the risks within its widely dispersed geographical area when compared to the other participating FRSs. This FRS is predominantly reliant on its OC firefighters to provide cover across its rural risks.

FRS 2 is a large FRS that incorporates urban, suburban and rural areas with a range of different risks. Within the wider FRS this FRS is seen as an innovative FRS within its regional area. Its staff are made up of a combination of WT and OC firefighters.

FRS 3 is a large FRS that covers a smaller geographical area within which there are a full range of risks including extensive urban risks. Personnel are both WT and OC. This FRS has a history of strong union representation and conflict with FRS management.

FRS 4 Covers some urban areas, light industry, and a widely dispersed suburban and rural areas and their associated risks. This FRS is viewed by its peers as being an innovative FRS.

FRS 5 has a similar risk exposure as FRSs 2, 4 and 5 and operates using both WT and OC members of staff.

5.1.4 The Management dimension of Safety Culture

The management dimension of the safety culture concept is based on operational safety being prioritised by management, who provide the time and resources to establish policies and procedures supported by a reporting system that triggers a timely response to risks communicated to them, and then feeding back the lessons learned.

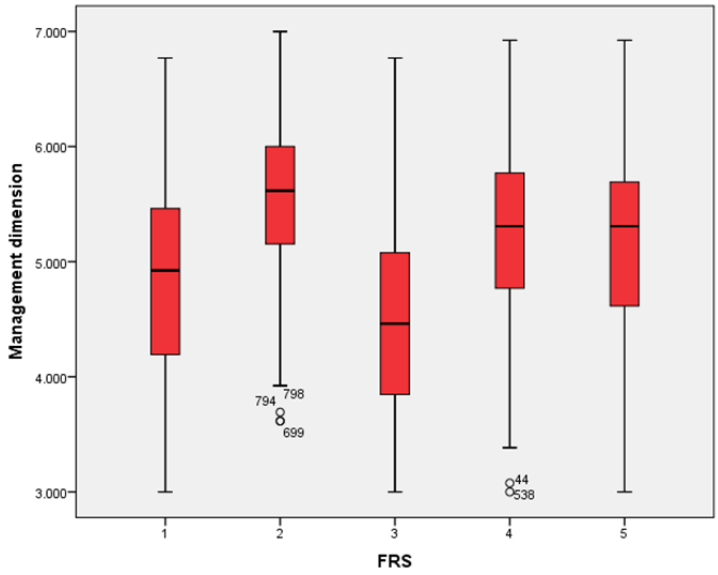
An analysis was performed on the data for the dimension Management using IBM FREQUENCIES AND EXPLORE on the dependent variable Management to evaluate the assumptions of a normal distribution. The statistics were: N = 800, M=5.089, SE=0.030, SD=0.851, Mdn=5.230, with 23 missing cases. There were 11 outliers present and their values had been changed to include them within their upper and lower boundaries of the data. A histogram with normal curve indicated graphically a negative skew and a high kurtosis. An examination of the skewness and kurtosis ratios of -5.463 and -1.987 respectively, indicated that the data was not from that of a normal distribution as although the kurtosis ratio was within the acceptable range of ±2 associated with a normal distribution, the skewness value was not. The Shapiro-Wilks test of Normality also indicated that the distribution is not that of a normal distribution, W=0.972, p=0.0001. A transformation using Log10 was made of the data but the results indicated that a normal distribution had still not been achieved.

Comparison between the five fire and rescue services in regard to the Management dimension.

There were an unequal number of cases between groups with 84, 157, 143, 212, 204 cases respectively for FRSs 1 to 5. The boxplots in Figure 5-2 of the five FRSs showed a similarity in distribution between FRSs 2, 4 and 5 with similar median values. FRS 1 and FRS 3 would appear to have similar distributions to each other but the location of their respective median values suggest there are differences between them. With the exception of FRS 3

the median value for the remaining FRSs indicate that the majority of subjects tend to have a positive attitude towards their FRS and how operational safety is managed.

Figure 5-2. Boxplot of the Management variable with FRS as the independent variable.



An analysis of the difference in Management mean scores was made using IBM SPSS ANOVA using the dependent variable Management and the factor FRS_Number.

The number of subjects, mean, standard deviation and standard error for each of the FRSs are shown in Table 5-3.

Table 5-3. Descriptives of the Management variable for each of the five FRS groups.

Descriptives

Management dimension

	N	Mean	Std. Deviation	Std. Error
1	84	4.7930	0.9013	0.0983
2	157	5.5287	0.6830	0.0545
3	143	4.4744	0.8779	0.0734
4	212	5.2130	0.7663	0.0526
5	204	5.1746	0.7289	0.0510
Total	800	5.0890	0.8504	0.0301

The Levene's test produced a significance value of p=0.001 which indicates that the assumption of homogeneity of variance within-groups has been violated but the ANOVA test is relatively robust particularly if the sample size is large enough.

The results of the ANOVA test are that there is a significant difference between the mean scores of the five FRSs ($F(4, 795)=39.830$, $p<0.001$) and that we can reject the null hypothesis. The effect size represents the amount of variance of the dependent variable, Management, which can be explained by the independent variable FRS_Number. Using the SPSS GLM analysis the partial Eta squared was 0.167 which, using Cohen's classification, relates to a large effect indicating the relative magnitude of the differences. The observed power computed at the 0.05 level was 1.000.

Using Tukey's post-hoc test to compare the results between the five FRSs we can see in Table 5-4 that the results indicate that there is no significant difference in response between FRSs 4 and 5. However, FRSs 1, 2 and 3 are significantly different not only to FRSs 4 and 5 but to each other.

Table 5-4. Homogeneous subsets of FRSs within the Management variable.

Management dimension

Tukey HSD[a,b]

FRS	N	Subset for alpha = 0.05			
		1	2	3	4
3	143	4.4744			
1	84		4.7930		
5	204			5.1746	
4	212			5.2130	
2	157				5.5287
Sig.		1.000	1.000	0.994	1.000

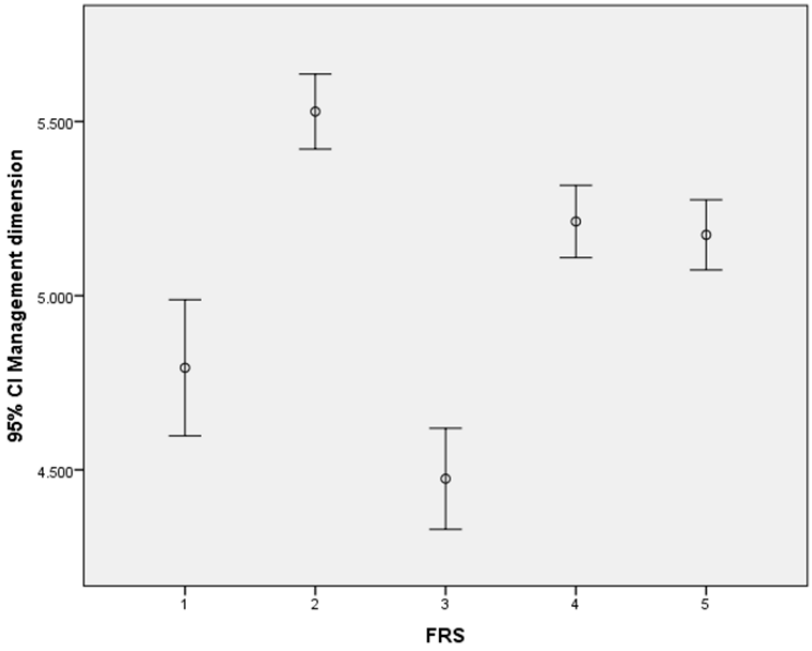
Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 143.323.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

The 95% confidence interval of the mean for each FRS is shown in Figure 5-3. We can see that the mean scores and their 95% confidence intervals for FRSs 4 and 5 are similar but FRSs 1, 2 and 3 are different suggesting they come from separate population. The range of responses and their mean scores confirm a generally positive attitude towards the management of operational safety within their respective FRSs. This supports the results of the Tukey's post-hoc test.

Figure 5-3. Error bar chart showing the median and 95% confidence interval of each FRS for the Management variable.



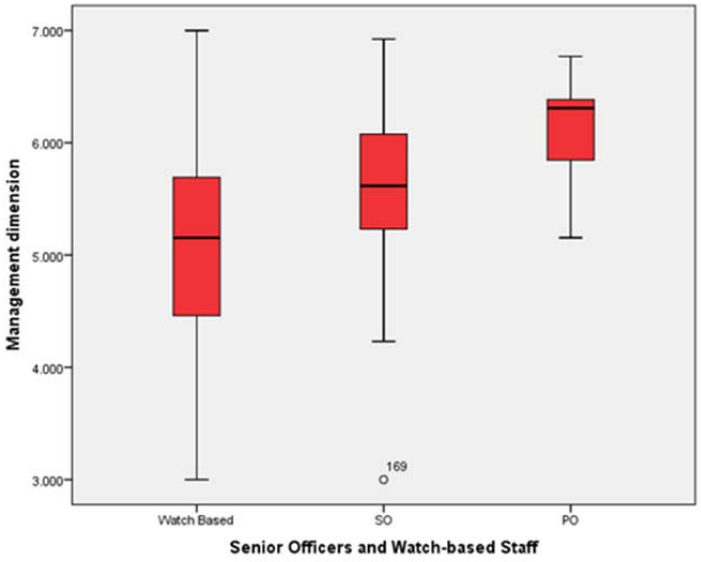
Comparison between principal officers, senior officers and watch-based staff in regard to the Management dimension.

The three role groups of Watch-Based staff (WB), Senior Officers (SO), and Principal Officers (PO) are used as a factor to investigate the impact of role. There are an unequal number of cases within each group, with WB=737, SO=41, PO=13. There were 23 missing cases. Initially, it was thought that the missing cases might be associated with SO or PO groups who might have been concerned they might be identified if they were to include this information due to their small numbers. Looking at the boxplots of the three role groups and a fourth group made up of the missing cases the distribution is very similar to that of the WB group. The numbers of missing values across the role groups were: PO had no missing cases; SO had 1, and WB had 21. An examination of the data indicated that the non-responses were random rather than being the result of systematic issues.

The boxplot in Figure 5-4 using the variable Management suggests that the responses of all three groups reflect a positive attitude to the Management dimension. The PO group is strongly negatively skewed and has a higher median value than the SO or WB groups. This would indicate that PO group has a stronger positive attitude towards the management aspects related to their FRS safety culture with WB staff having the least positive attitude to

their FRSs management of operational safety of the three groups. It is notable that the variance decreases as seniority increases.

Figure 5-4. Boxplot of the three role groups using the Management variable.



An analysis of the difference in Management scores between the groups PO, SO and WB was made using IBM SPSS ANOVA with the transformed dependent continuous variable Management and the factor Role. The statistics for each group were: the PO group's values were M=6.125, SD=0.497, SE=0.138: the SO group's values were M=5.602; SD=0.716, SE=0.112: the WB group's values were M=5.044; SD=0.839; and SE=0.031.

The Levene's test result was p=0.010 indicating the assumption of homogeneity of variance within groups had been violated. The results of the ANOVA test are that there is a significant difference between the within-group mean scores of the three groups of PO, SO, and WB ($F(2, 790)=19.057$, $p<0.001$) and that any differences were not the result of random chance. Using the SPSS GLM analysis the partial Eta squared was 0.046 which using Cohen's classification, relates to a small effect indicating the relative magnitude of the differences. The observed power computed at the 0.05 level was 1.000.

The results of the Tukey's post-hoc tests in Table 5-5 indicated that there were three subsets within the data all with significantly different mean scores between them. This was reflected in the visual impression provided by the error bar chart in Figure 5-5.

Table 5-5. Homogeneous subsets of the three role groups using the Management variable.

Management sub-dimension

Tukey HSD[a,b]

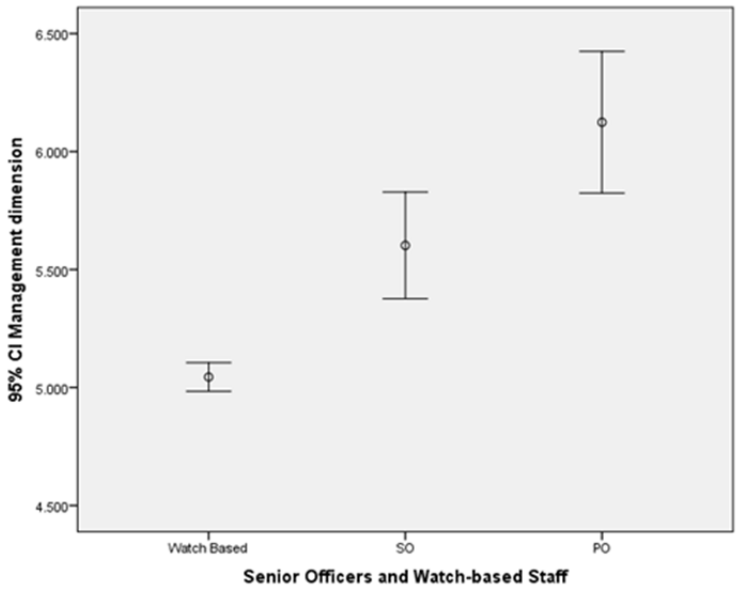
Officers and Watch-based Staff	N	Subset for alpha = 0.05		
		1	2	3
Watch Based	737	5.0443		
SO	41		5.6024	
PO	13			6.1246
Sig.		1.000	1.000	1.000

Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 29.220.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

Figure 5-5. Error bar chart showing the median and 95% confidence interval for each of the role groups for the Management variable.



5.1.5 The Procedures dimension of Safety Culture

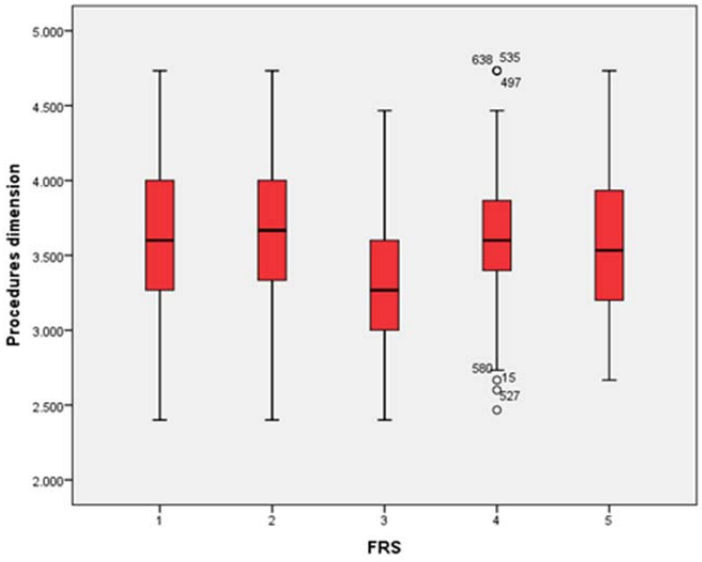
The procedures dimension of the safety culture concept covered perceptions of how management view the use of procedures; the value of the reporting procedure; the suitability of the procedures; that current procedures select managers and not leaders; and the lack of operational low-level supervision.

An analysis was performed on the data for the dimension Procedures to evaluate the assumptions of a normal distribution. The dependent variable statistics included 6 missing cases due to the number of non-responses in the questions contributing to this variable. Six outliers were identified and their values changed to reduce their impact. The statistics after the outlier values had been changed were: N = 797, M=3.521, SD=0.805, Mdn=3.530 and SE=0.029. A histogram with normal curve indicated graphically that the distribution was close to that of a normal distribution. The skewness and kurtosis ratios were 2.085 and -1.852 respectively indicating they were close to ±2 of a normal distribution. The Shapiro-Wilk test for normality indicated that this was not a normal distribution. Transformations were unsuccessful in producing a normal distribution. Due to the robustness associated with larger sample sizes it was decided to use both parametric and non-parametric tests and then compare the results.

Comparison between the five fire and rescue services in regard to the Procedures dimension.

The boxplot in Figure 5-6 suggests that there is some similarity in the responses between FRSs 1 and 2 and between FRSs 4 and 5. FRS 3 shows a similar spread to the other FRSs between the 25th and 75th percentiles but the median value is of a lower value showing a more positive skew. The following tests were conducted so as to determine whether there was a significant difference between the groups, and particularly in regard to FRS 3, or was it due to random chance.

Figure 5-6. Boxplot of the Procedures variable with FRS as the independent variable.



A one-way between-groups analysis of variance was conducted using IBM SPSS ANOVA to explore the difference in attitudes to procedures between the five FRSs using the variable Procedures as the independent variable. The number of subjects, mean, standard deviation and standard error for each FRS is shown in Table 5-6.

Table 5-6. Descriptives of the Procedures variable for each of the five FRS groups.

Descriptives

Procedures dimension

FRS	N	Mean	Std. Deviation	Std. Error
1	83	3.62651	0.523273	0.057437
2	158	3.68776	0.480510	0.038227
3	142	3.30469	0.424721	0.035642
4	212	3.63868	0.406571	0.027923
5	202	3.58350	0.496034	0.034901
Total	797	3.57365	0.478099	0.016935

The Levene's test returned a value of p=0.001 indicating that we should reject the assumption of homogeneity of variance within the groups. The ANOVA test indicated there was a statistically significant difference at the p<0.05 level in Procedures mean scores for the five FRSs [F(4, 796)=5.839, p=<0.001]. Using the SPSS GLM analysis the partial Eta squared was 0.074 which relates to a medium effect indicating the relative magnitude of the differences. The observed power computed at the 0.05 level was 1.000.

Tukey's Post-hoc tests to determine differences between groups indicated that there were two subsets within the data with significantly different mean scores. These are shown in Table 5-7 where we can see that FRS 1 is in a subset of its own whilst the remaining FRSs 2, 3, 4, and 5 are in their own distinct subset.

Table 5-7. Homogeneous subsets of FRSs within the Procedures variable.

Procedures dimension

Tukey HSD[a,b]

FRS	N	Subset for alpha = 0.05	
		1	2
3	142	3.30469	
5	202		3.58350
1	83		3.62651
4	212		3.63868
2	158		3.68776
Sig.		1.000	0.314

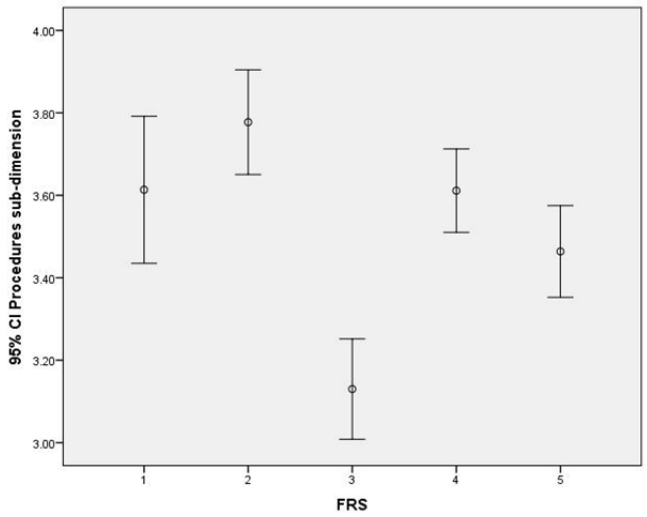
Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 142.503.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

The 95% confidence interval of the means for each of the FRSs is shown in Figure 5-7. FRS 3 is markedly different in its mean value when compared to the remaining four FRSs. In this figure we can see graphically the results of the Tukey's post-hoc tests in that the remaining FRSs show a considerable amount of overlap with the means of FRSs 2, 4, and 5 all falling between the error bars of FRS 1. FRS 3 exhibits the least positive attitude towards those issues related to procedures with FRS 2 having the most positive attitude towards procedures. Overall, the mean scores of the five FRS indicate a level of negativity towards the subject of their operational procedures.

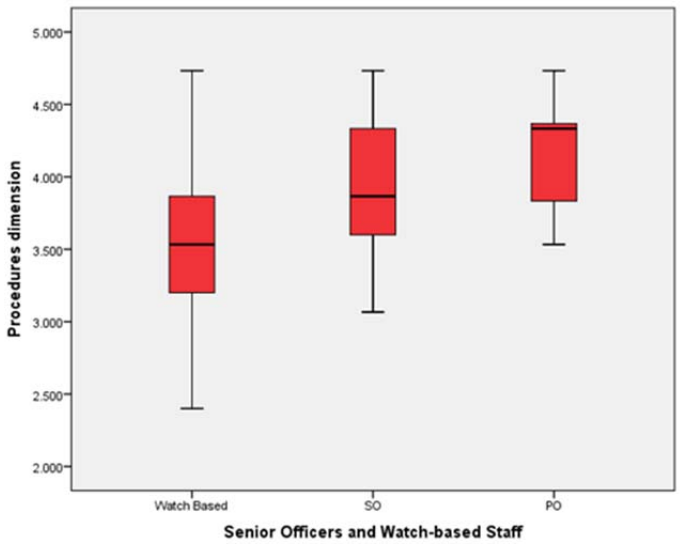
Figure 5-7. Error bar chart showing the median and 95% confidence interval of each FRS for the Procedures variable.



Comparison between principal officers, senior officers and watch-based staff in regard to the Procedures dimension.

Figure 5-8 shows three boxplots of the variable Procedures. From this we can see a highly skewed positive distribution for the PO group but the median value for the PO and that of the SO groups are similar when compared to that of the WB group suggesting there may be at least two subsets within the data.

Figure 5-8. Boxplot of the three role groups using the Procedures variable.



The Levene's test value was p=0.658 indicating that we should not reject the null hypothesis of there being no differences in the homogeneity of the three groups. A one-way between-groups analysis of variance was conducted using IBM SPSS ANOVA to explore the difference in attitudes to Procedures between the three groups using the variable Procedures as the dependent variable. There was a statistically significant difference at the p<0.05 level in the Procedures mean scores for the three groups [F(2, 786)=23.736, p=0.001]. The partial Eta squared was 0.057, which relates to a small, although close to being classified as a medium effect, indicating the relative magnitude of the differences. The observed power computed at the 0.05 level was 1.000. Post-hoc comparisons using the Tukey's post-hoc test indicated that the mean score for the WB group was (M=3.544, SD=0.467) which was significantly different than the scores for both PO and SO groups. The mean score for the SO group (M=3.927, SD=0.470) and that of the PO group (M=4.189, SD=0.368) were not significantly different. There were therefore two subsets within the data with significantly different mean scores. The first subset consisted of WB staff and the second subset of PO and SO groups as can be seen in Table 5-8.

Table 5-8. Homogeneous subsets of the three role groups using the Procedures variable.

Procedures dimension

Tukey HSD[a,b]

Officers and Watch-based Staff	N	Subset for alpha = 0.05	
		1	2
Watch Based	734	3.54378	
SO	41		3.92683
PO	12		4.18889
Sig.		1.000	0.094

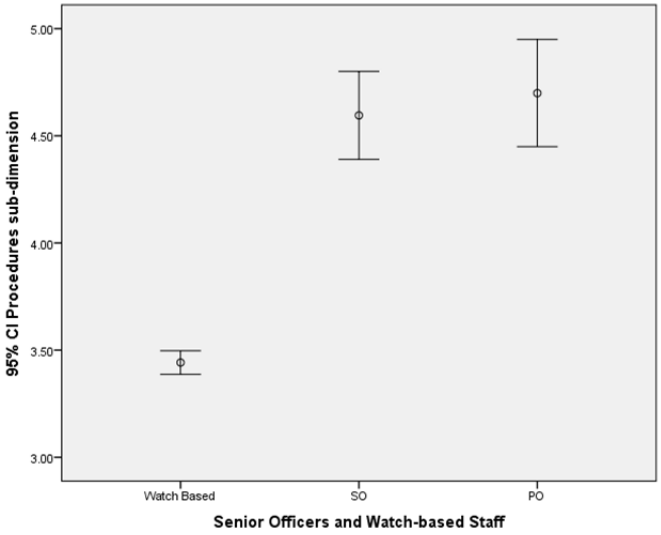
Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 27.501.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

The 95% confidence interval of the mean scores for the groups WB, SO and PO indicated that the means between SO and PO groups were similar although the PO group confidence interval was slightly greater than for the SO group. The confidence interval for the WB group was a lot tighter and very different than for either SO or PO groups. However, the confidence interval is dependent on the sample size which is reflected in this case. This can be seen graphically in the error bar chart in Figure 5-9.

Figure 5-9. Error bar chart showing the median and 95% confidence interval for each of the role groups for the Procedures variable.



5.1.6 The Competence dimension of Safety Culture

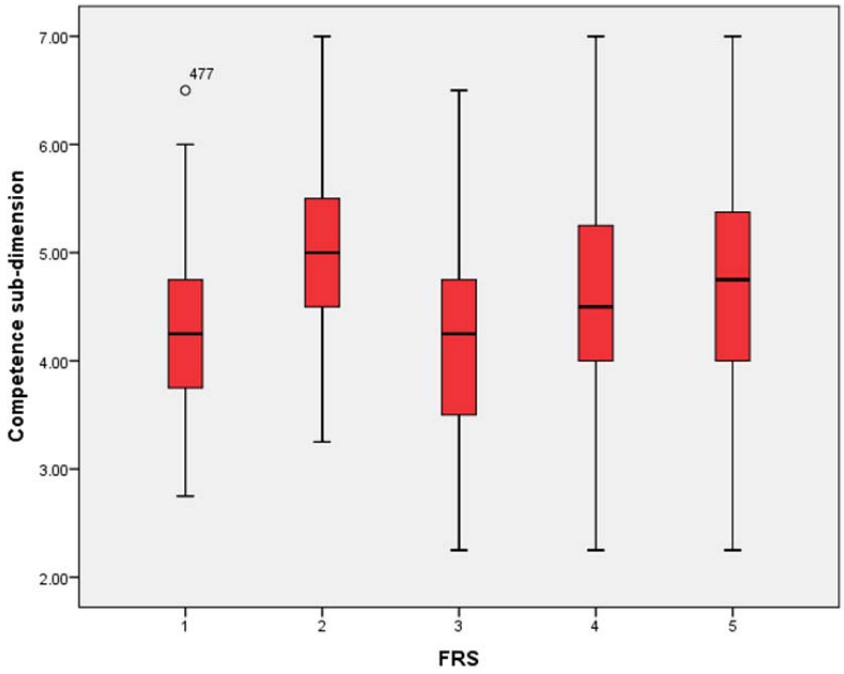
The competence dimension of the safety culture concept is based on the average scores of the different variables associated with issues such as individual and work colleagues being competent to use procedures; being able to recognise unsafe behaviour; the level of training; and feedback on performance.

An analysis was performed on the variable representing the dimension Competency to evaluate the assumptions of a normal distribution. A histogram with normal curve indicated graphically a normal distribution. The ratio scores for skewness and kurtosis, at -0.376 and 0.565 respectively also indicated that the distribution was normal. Seven outliers were identified and having confirmed they were not the result of incorrect data entry they were retained but their scores amended to the values of the outer range of the boxplot so as to reduce their impact. The distribution statistics were N = 816, M=4.017, SD=0.684, SE=0.024, Mdn=4.000. The ratios for skewness and kurtosis were within the bounds of a normal distribution at -4.323 and -0.870 respectively. The new histogram with normal curve indicated a normal distribution.

Comparison between the five fire and rescue services in regard to the Competence dimension.

An initial look at the boxplot in Figure 5-10 for the dependent variable Competence with the independent variable based on FRSs shows that FRSs 3, 4 and 5 are fairly similar regarding their median values and distributions. FRSs 1 and 2 appear to have different median values to each other and the remaining FRSs. FRS 2 has a tighter spread between the 25th and 75th percentiles than the other FRSs.

Figure 5-10. Boxplot of the Competence variable with FRS as the independent variable.



The Levene's statistic was significant at p=0.001 indicating that there is a difference in the variances between groups. A one-way between-groups analysis of variance was conducted using IBM SPSS ANOVA to explore the difference in attitudes to Competency between the five FRSs. The number of subjects, mean, standard deviation, and standard error for each of the FRSs is shown in Table 5-9. There was a statistically significant difference at the p<0.05 level in the Competence mean scores for the five groups [F(4, 815)=3.489, p=0.001]. The partial Eta squared was 0.045 which relates to a medium effect relative to the magnitude of the differences. The observed power computed at the 0.05 level of significance was 1.000.

Table 5-9. Descriptives of the Competence variable for each of the five FRS groups.

Descriptives

Competence dimension

FRS	N	Mean	Std. Deviation	Std. Error
1	86	4.02907	0.612875	0.066088
2	158	4.20886	0.558562	0.044437
3	145	3.74483	0.695015	0.057718
4	220	4.05114	0.674003	0.045441
5	207	4.02295	0.729754	0.050721
Total	816	4.01777	0.679672	0.023793

Tukey's Post-hoc tests indicated that there were two subsets within the data with significantly different means. These are shown in Table 5-10 with FRS 1 being in the first subset and the remaining four FRSs forming a second subset.

Table 5-10. Homogeneous subsets of FRSs within the Competence variable.

Competence dimension

Tukey HSD[a,b]

FRS	N	Subset for alpha = 0.05	
		1	2
3	145	3.74483	
5	207		4.02295
1	86		4.02907
4	220		4.05114
2	158		4.20886
Sig.		1.000	0.120

Means for groups in homogeneous subsets are displayed.

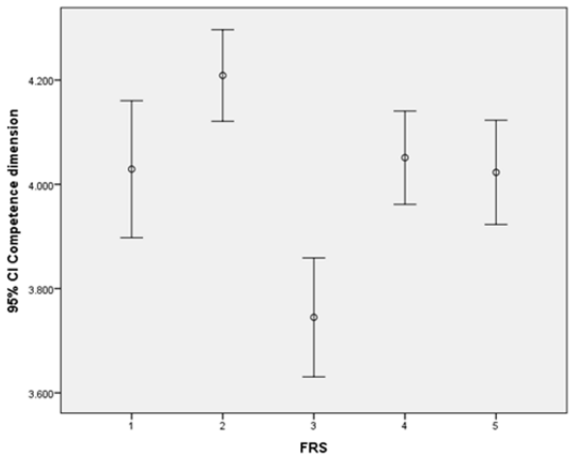
a. Uses Harmonic Mean Sample Size = 146.071.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

The 95% confidence interval of the means for each FRS is shown in Figure 5-11. We can see that FRSs 1 and 3 have similar means and confidence intervals.

FRSs 4 and 5 have means that fall within each other's confidence intervals. FRS 2 however, shares no overlap with either the means of the other FRSs or their confidence intervals. This graphically confirms the results of Tukey's post-hoc tests.

Figure 5-11. Error bar chart showing the median and 95% confidence interval of each FRS for the Competence variable.



A comparison was made between the parametric tests and non-parametric tests in which it was noted that there is a discrepancy between the test results in that the ANOVA one-way between-groups test found no statistically significant difference between FRSs 1 and 3, or for FRSs 2 and 5, but the non-parametric tests in the form of a series of Mann-Whitney U-tests identified that there were statistically significant differences. Table 5-11 shows graphically the differences in findings between the two tests. On the left is the result of the ANOVA post hoc tests, and on the right a summary of all of the Mann-Whitney tests. From those two tables we can see that both the discrepancies involve FRS 2. Looking at the boxplots for the five FRSs, Figure 5-10, we can see that FRS 2 is the only FRS that has a pronounced negative skew between the 25th and 75th percentiles. It also has an outlier on the negative side of the distribution. Removing that outlier and rerunning the test did not significantly change the results of the Mann-Whitney tests. On this occasion this researcher believes it is prudent to give weighting to the non-parametric test results and accept the differences between FRS 2 and the FRSs 1 and 5.

Table 5-11. ANOVA post hoc tests and Summary of Mann-Whitney tests for comparison for the Variable COMPETENCE by the five FRSs.

Tukey HSD

(I) FRS		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1	2	-0.1798	0.0892	0.2598	-0.4238	0.0642
	3	.284242*	0.0906	0.0152	0.0364	0.5320
	4	-0.0221	0.0847	0.9990	-0.2536	0.2095
	5	0.0061	0.0854	1.0000	-0.2274	0.2397
2	1	0.1798	0.0892	0.2598	-0.0642	0.4238
	3	.464033*	0.0766	0.0000	0.2547	0.6734
	4	0.1577	0.0694	0.1553	-0.0321	0.3476
	5	0.1859	0.0704	0.0638	-0.0064	0.3782
3	1	-.284242*	0.0906	0.0152	-0.5320	-0.0364
	2	-.464033*	0.0766	0.0000	-0.6734	-0.2547
	4	-.306309*	0.0712	0.0002	-0.5011	-0.1116
	5	-.278119*	0.0721	0.0012	-0.4753	-0.0810
4	1	0.0221	0.0847	0.9990	-0.2095	0.2536
	2	-0.1577	0.0694	0.1553	-0.3476	0.0321
	3	.306309*	0.0712	0.0002	0.1116	0.5011
	5	0.0282	0.0645	0.9924	-0.1481	0.2045
5	1	-0.0061	0.0854	1.0000	-0.2397	0.2274
	2	-0.1859	0.0704	0.0638	-0.3782	0.0064
	3	.278119*	0.0721	0.0012	0.0810	0.4753
	4	-0.0282	0.0645	0.9924	-0.2045	0.1481

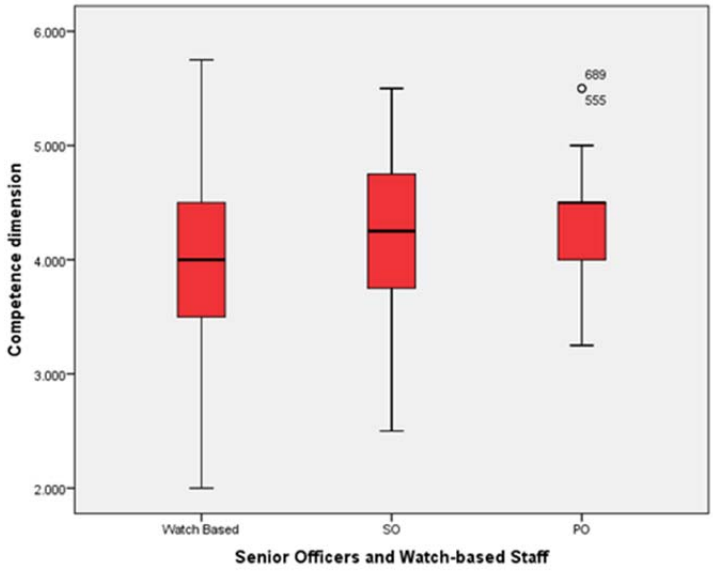
*. The mean difference is significant at the 0.05 level.

		2	3	4	5
1	*U*=	5740.000	4799.000	9182.000	8793.000
	z=	-2.017	-2.943	-0.402	-0.165
	Asymp.Sig.	0.044	0.003	0.687	0.869
	r=	-0.129	-0.194	-0.023	-0.010
	Sample size	244	231	306	293
2	*U*=		7194.500	15342.500	14249.500
	z=		-5.631	-1.959	-2.121
	Asymp.Sig.		0.000	0.050	0.034
	r=		-0.323	-0.101	-0.111
	Sample size		303	378	365
3	*U*=			12023.000	11647.500
	z=			-4.005	-3.596
	Asymp.Sig.			0.000	0.000
	r=			-0.210	-0.192
	Sample size			365	352
4	*U*=				22418.500
	z=				-0.278
	Asymp.Sig.				0.781
	r=				-0.013
	Sample size				427

Comparison between principal officers, senior officers and watch-based staff in regard to the Competence dimension.

A review of the boxplots in Figure 5-12 for the three groups using the dependent variable Competence indicates that the PO group has a smaller spread, although with some outliers, than the two other groups. It also has a positive skew whereas the WB group appears normal and the SO group has a negative skew. The WB group is distributed evenly across the mid-point of the 7-Likert scale with the SO group having a slightly more positive attitude than the WB group, whilst the PO group is the most positive of the three groups.

Figure 5-12. Boxplot of the three role groups using the Competence variable.



A one-way between-groups analysis of variance was conducted using IBM SPSS ANOVA to explore the difference in attitudes to competence between the three groups of PO, SO, WB using the dependent variable Competence.

The Levene's statistic was not significant at p=0.878 indicating that we should not reject the null hypothesis of equal variances between groups. Table 5-12 shows the number of subjects, mean, standard deviation and standard error for each role group.

Table 5-12. Descriptives of the Competence variable for each of the three role groups.

Descriptives

Competence dimension

	N	Mean	Std. Deviation	Std. Error
Watch Based	751	4.00366	0.677670	0.024729
SO	42	4.17857	0.665541	0.102695
PO	13	4.42308	0.664459	0.184288
Total	806	4.01954	0.679107	0.023921

There was no significant difference at the p<0.05 level in Competence mean scores for the three groups of PO, SO and WB [F(2, 805)=3.676, p=0.026]. The partial Eta squared was 0.009 which relates to a very small effect in regard to the magnitude of the differences. The observed power computed at the 0.05 level of significance was 0.677.

Tukey's post-hoc test results in Table 5-13 show that there are two subsets; the first incorporates the WB group with a mean score of M=4.004, whilst the PO group with a mean score of M=4.423 is located in a second subset. The SO group with a mean score of 4.179 could be located in either subset.

Table 5-13. Homogeneous subsets of the three role groups using the Competence variable.

Competence dimension

Tukey HSD[a,b]

Officers and Watch-based Staff	N	Subset for alpha = 0.05	
		1	2
Watch Based	751	4.00366	
SO	42	4.17857	4.17857
PO	13		4.42308
Sig.		0.583	0.349

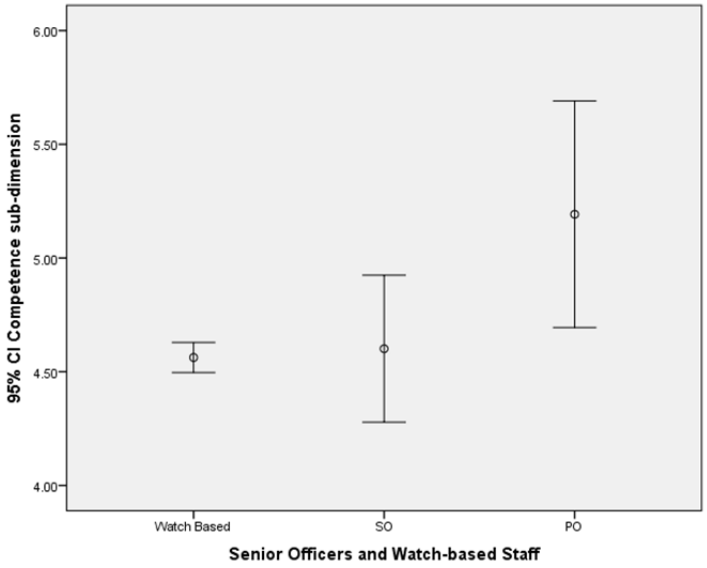
Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 29.393.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

The 95% confidence intervals for the WB and SO groups in Figure 5-13 displays an overlap supporting the finding of no difference in the null hypothesis of equal means between watch-based personnel and senior officers. The means of both groups are encompassed by the error bar of the other group. Although there is some overlap between the SO and PO groups neither includes the mean score of the other group within the range of its error bar. However, what is interesting is the number of subjects for each group in comparison to the spread. The smallest confidence interval is that of the WB group (N=751) which has the largest number of subjects and shows a slightly positive attitude towards competence. The SO group (N=42) has a wider confidence interval and the most negative attitude of the three groups towards competency within operational safety. The PO group (N=13), with the smallest number of subjects, has the greatest spread for its 95% confidence interval but shows the most positive attitude towards competence. The Error chart supports visually the findings of the ANOVA and non-parametric tests.

Figure 5-13. Error bar chart showing the median and 95% confidence interval for each of the role groups for the Competence variable.



When comparing the non-parametric results to the parametric (ANOVA) results there is a discrepancy which is shown in Figure 5-14. On the left are the results of the ANOVA one-way between-groups parametric test. On the right is a summary of a series of Mann-Whitney non-parametric tests using the same dataset. We can see that the parametric test found no statistically significant differences between any of the pairings between the role groups of PO, SO, or WB. This is in contrast to the use of non-parametric tests that indicate there is a statistically significant difference between the mean scores of the WB and PO groups.

Reviewing the boxplots in Figure 5-12 we can see that the PO group is much more negatively skewed that either the WB or SO groups. The PO group also has two outliers. Changing the values of these outliers and rerunning the tests made no change to the outcome. The researcher made the decision that in the circumstances that preference would be given to the results of the non-parametric tests and acknowledge the statistically significant differences between the PO and WB groups.

Table 5-14. ANOVA post hoc tests and Summary of Mann-Whitney tests for comparison for the Variable COMPETENCE by the three role groups of PO, SO, and WB.

Tukey HSD

(I) Senior Officers and Watch-based Staff		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Watch Based	SO	-0.1749	0.1073	0.234	-0.4269	0.0771
	PO	-0.4194	0.1893	0.069	-0.8640	0.0252
SO	Watch Based	0.1749	0.1073	0.234	-0.0771	0.4269
	PO	-0.2445	0.2148	0.491	-0.7489	0.2599
PO	Watch Based	0.4194	0.1893	0.069	-0.0252	0.8640
	SO	0.2445	0.2148	0.491	-0.2599	0.7489

		SO	PO
WB	*U*=	13298.000	3279.000
	z=	-1.723	-2.044
	Asymp.Sig.	0.085	0.041
	r=	-0.061	-0.074
	Sample siz	793	764
SO	*U*=		299.000
	z=		-0.882
	Asymp.Sig.		0.378
	r=		-0.119
	Sample size		55

5.1.7 Work Pressure dimension of Safety Culture

The work pressure dimension of the safety culture concept is based on the average scores of the different variables associated with issues such as the time available to train using operational procedures following a change in focus of the role of the FRS; the number of procedures that are documented and the different combinations of them that may be required to be implemented at different types of incidents.

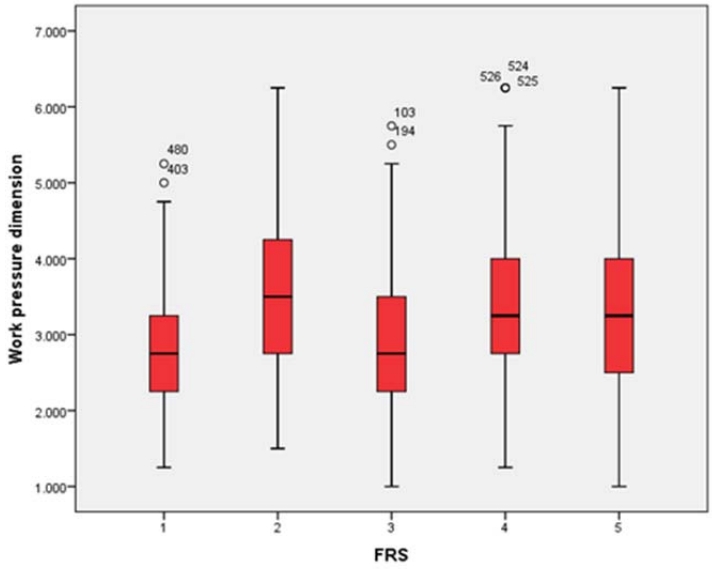
An analysis was performed on the data for the dimension Work Pressure to evaluate the assumptions of a normal distribution. There were 6 missing cases due to the high number of non-responses by the subjects in the variables contributing to the measure of Work Pressure, and six outliers had their values changed. Statistics for this variable are: N = 817, M=3.283, SD=1.018, SE=0.036, Mdn=3.250. A histogram with normal curve indicated graphically a slight positive skew whilst the ratio scores for skewness and kurtosis, at 4.408 and -1.176 respectively indicated that the positive skew was not consistent with a normal distribution.

Comparison between the five fire and rescue services in regard to the Work Pressure dimension.

A comparison of the distribution of the five FRSs in Figure 5-14 indicates a similarity in distribution and median value between FRSs 2, 4 and 5. FRSs 1 and 3 share a similar

distribution and median with each other. With the exception of FRS 2 the remaining FRSs have a number of outliers.

Figure 5-14. Boxplot of the Work Pressure variable with FRS as the independent variable.



A one-way between-groups analysis of variance was conducted using IBM SPSS ANOVA to explore the difference in attitudes to work pressure between the five FRSs using the dependent variable Work Pressure. The number of subjects, mean, standard deviation and standard error for each FRS is shown in Table 5-15.

Table 5-15. Descriptives of the Competence variable for each of the five FRS groups.

Descriptives

Work pressure dimension

FRS	N	Mean	Std. Deviation	Std. Error
1	87	2.79885	0.903674	0.096884
2	158	3.57120	0.981554	0.078088
3	144	2.96701	1.017009	0.084751
4	221	3.41516	0.951307	0.063992
5	207	3.34058	1.030751	0.071642
Total	817	3.28182	1.014477	0.035492

The Levene's statistic was not significant at p=0.567 indicating that we should not reject the null hypothesis of equal variances between groups. There was a statistically significant difference at the p<0.05 level in the mean scores for the five FRSs [F(4, 816)=13.520, p=0.001]. The partial Eta squared was 0.062 which relates to a medium effect indicating the

relative magnitude of the differences. The observed power computed at the 0.05 level was 1.000.

Tukey's Post-hoc tests indicated that there were two subsets within the data with significantly different means. These are shown in Table 5-16 with FRSs 3 and 1 in the first subset and FRSs 5, 4, and 2 making up the second subset.

Table 5-16. Homogeneous subsets of FRSs within the Work Pressure variable.

Work pressure dimension

Tukey HSD[a,b]

FRS	N	Subset for alpha = 0.05	
		1	2
1	87	2.79885	
3	144	2.96701	
5	207		3.34058
4	221		3.41516
2	158		3.57120
Sig.		0.588	0.265

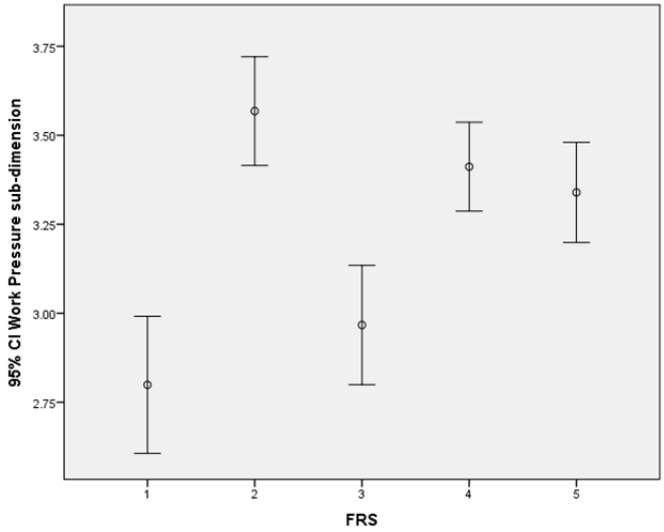
Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 146.526.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

The 95% confidence interval of the means for each FRS is shown in Figure 5-15. FRSs 4 and 5 are very similar in the location of their mean score and confidence interval, and they share a partial overlap with FRS 2. Tukey's post-hoc test identified all three FRSs as being part of the same subset. FRSs 1 overlaps FRS 3, which supports them being members of their own subset which supports the information shown graphically in Figure 5-15.

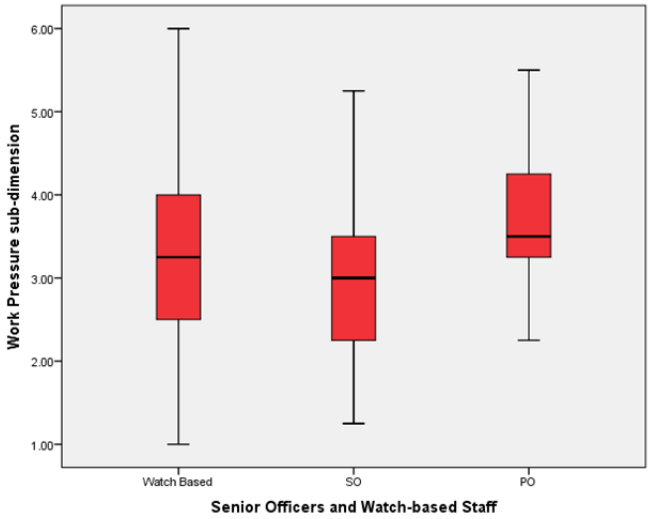
Figure 5-15. Error bar chart showing the median and 95% confidence interval of each FRS for the Work Pressure variable.



Comparison between principal officers, senior officers and watch-based staff in regard to the Work Pressure dimension.

In Figure 5-16 the boxplots of the three groups of WB, SO, and PO indicate that there is a similar spread between the groups WB and SO, but the PO group is highly positively skewed when compared to the WB and SO groups. Cases for each group were: WB=752, SO=42, PO=13.

Figure 5-16. Boxplot of the three role groups using the Work Pressure variable.



A one-way between-groups analysis of variance was conducted using IBM SPSS ANOVA to explore the difference in attitudes to work pressure between the five FRSs using the variable Work Pressure as the independent variable. The number of subjects, mean, standard deviation, and standard error are shown in Table 5-17.

Table 5-17. Descriptives of the Work Pressure variable for each of the three role groups.

Descriptives

Work pressure dimension

	N	Mean	Std. Deviation	Std. Error
Watch Based	752	3.29422	1.011892	0.036900
SO	42	3.01190	0.981463	0.151443
PO	13	3.71154	0.988718	0.274221
Total	807	3.28625	1.012179	0.035630

The Levene's statistic was significant at p=0.979 indicating that we should not reject the null hypothesis of equal variances between groups. The ANOVA test indicated that there was a statistically significant difference at the p<0.05 level in Work Pressure scores for the five FRSs with $F(2, 806)=2.725$, p=0.066. The partial Eta squared was 0.007 which relates to a small effect indicating the relative magnitude of the differences. The observed power computed at the 0.05 level was 0.539.

Tukey's post-hoc tests revealed that there are two subsets within the data with significant differences between them. These can be seen in Table 5-18. The WB group is in the first subset and the PO group in the second subset. The SO group can be associated with either subset.

Table 5-18. Homogeneous subsets of the three role groups using the Work Pressure variable.

Work pressure dimension

Tukey HSD[a,b]

Officers and Watch-based Staff	N	Subset for alpha = 0.05	
		1	2
SO	42	3.01190	
Watch Based	752	3.29422	3.29422
PO	13		3.71154
Sig.		0.532	0.253

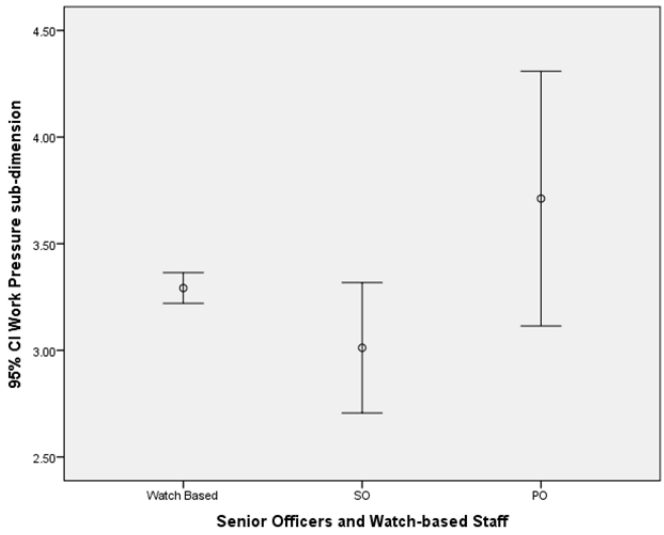
Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 29.394.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

The 95% confidence interval of the median scores are shown in Figure 5-17. This shows that there is no overlap between the mean scores and their confidence intervals for the groups WB and PO. However, the SO group overlaps the smaller confidence interval of the WB group and part of the PO group. This supports the data shown in Table 5-17.

Figure 5-17. Error bar chart showing the median and 95% confidence interval of each role group for the Work Pressure variable.



5.1.8 The concept of Safety Culture

The Safety Culture variable is a composite variable using the combined average scores of its four constituent dimensions of Management, Procedures, Competency, and Work Pressure.

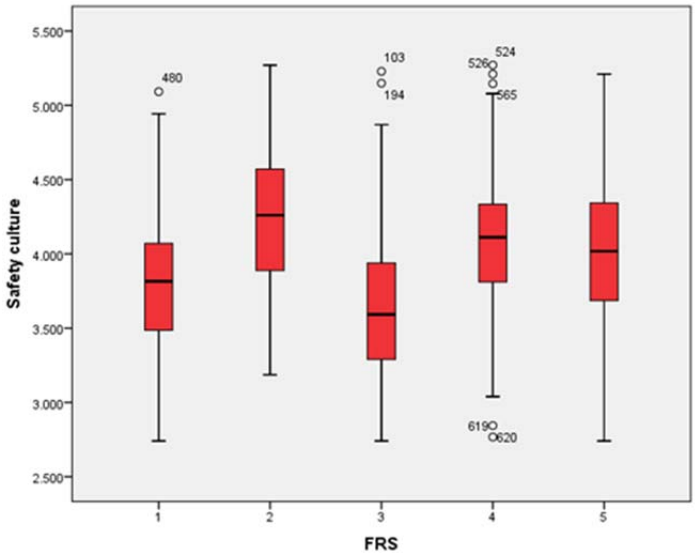
An analysis was performed on the data for the concept Safety Culture to evaluate the assumptions of a normal distribution. Using the dependent variable Safety Culture there were 54 missing cases. These arose from the missing responses across the four dimensions contributing to this concept. There were nine outliers, spread across the ends of the scale, which were identified by use of a boxplot. Having confirmed the outliers were not the result of incorrect data entry or a pattern associated with them they were retained but the scores amended to the values of the outer range of the boxplot so as to reduce their impact. Statistics for this variable are N= 769, M=3.998, SD=0.508, SE=0.018, Mdn=3.986. A histogram with normal curve indicated a normal distribution. The ratio scores for skewness and kurtosis, at -0.1094 and -0.968 respectively indicated that they were both consistent

with that of a normal distribution. The Shapiro-Wilks test indicated that with a p=0.060 we should not reject the null hypothesis.

Comparison between the five fire and rescue services in regard to their scores for the concept of Safety Culture.

The boxplots in Figure 5-18 indicate that FRSs 4 and 5 have similar distributions and median values; FRS 2 has the highest median score. FRSs 1 and 3 are similar to each other but distinct from the remaining FRSs.

Figure 5-18. Boxplot of the Safety Culture variable with FRS as the independent variable.



A one-way between-groups analysis of variance was conducted using IBM SPSS ANOVA to explore the difference in mean scores for the concept of safety culture between the five FRSs using the variable Safety Culture as the dependent variable. The number of subjects, mean, standard deviation, standard error, and median for each group is shown in Table 5-19.

Table 5-19. Descriptives of the Safety Culture variable for each of the five FRS groups.

Descriptives

Safety culture

FRS	N	Mean	Std. Deviation	Std. Error
1	79	3.82154	0.503240	0.056619
2	154	4.24297	0.447690	0.036076
3	138	3.62586	0.494662	0.042108
4	202	4.09525	0.421025	0.029623
5	196	4.03919	0.483914	0.034565
Total	769	3.99819	0.508124	0.018323

The Levene's statistic was not significant at p=0.254 indicating that we should not reject the null hypothesis of equal variances between groups. There was a statistically significant difference at the p<0.05 level in Safety Culture scores for the five FRSs [F(4, 768)=38.209, p=0.001]. The partial Eta squared was 0.167 which relates to a large effect indicating the relative magnitude of the differences. The observed power computed at the 0.05 level was 1.000.

Tukey's Post-hoc tests indicated that there were three subsets within the data with significantly different mean scores. These are shown in Table 5-20 with FRSs 3 forming the first subset; FRS 1 the second subset; FRSs 5 the third; and FRS 2 the fourth subset. FRS 4 could be located within either subset 3 or 4.

Table 5-20. Homogeneous subsets of FRSs within the Safety Culture variable.

Safety culture

Tukey HSD[a,b]

FRS	N	Subset for alpha = 0.05			
		1	2	3	4
3	138	3.62586			
1	79		3.82154		
5	196			4.03919	
4	202			4.09525	4.09525
2	154				4.24297
Sig.		1.000	1.000	0.856	0.066

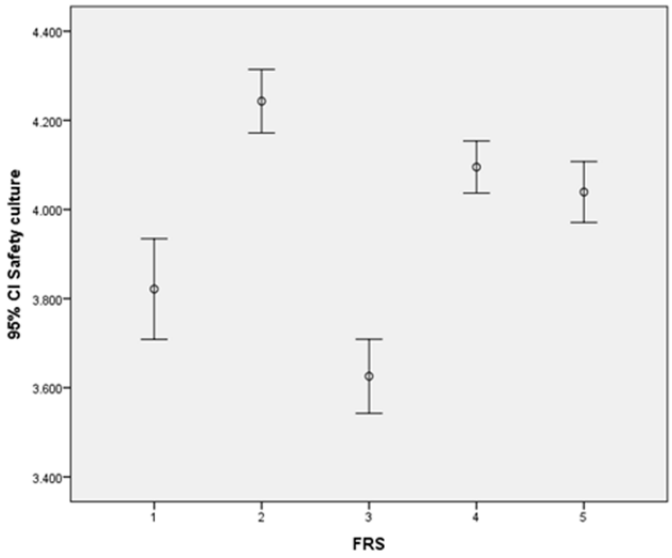
Means for groups in homogeneous subsets are displayed.

a. Uses Harmonic Mean Sample Size = 137.172.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

The 95% confidence intervals of the median scores for each FRS is shown in Figure 5-19. This shows that for FRSs 4 and 5 we can see the similarity of their median scores and their confidence intervals which overlap each other. FRSs 1 and 3 have very little overlap with each other suggesting they are in different subsets. FRS 2 stands alone showing a significantly different and positive attitude towards safety culture in an operational context. FRS 4 and 5 exhibited a more neutral attitude whilst FRSs 1 and 3 exhibited slightly negative attitudes. This confirms the findings of Tukey's post-hoc tests.

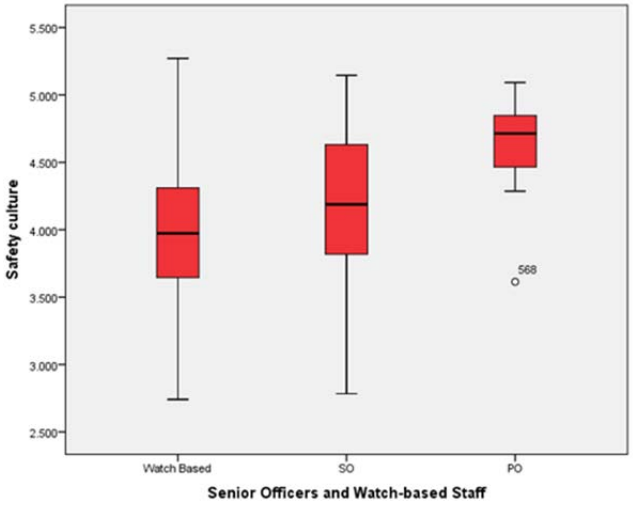
Figure 5-19. Error bar showing the median and 95% confidence interval of each FRS for the Safety Culture variable.



Comparison between principal officers, senior officers and watch-based staff in regard to their scores for the concept of Safety Culture.

Figure 5-20 shows the distributions of the three groups based on WB, SO and PO roles. We can observe that all three have different median values. All have a skewed distribution with that of the WB group being slightly positively skewed, a slight negative skew for the SO group, and a fairly negatively skewed distribution for the PO group for what is a relatively small group.

Figure 5-20. Boxplot of the three role groups using the Safety Culture variable.



A one-way between-groups analysis of variance was conducted using IBM SPSS ANOVA to explore the difference in scores to safety culture between the three groups using the variable Safety Culture as the dependent variable. The number of subjects, mean, standard deviation, standard error, and median for each of the groups is shown in Table 5-21.

Table 5-21. Descriptives of the Safety Culture variable for each of the three role groups.

Descriptives

Safety culture

	N	Mean	Std. Deviation	Std. Error
Watch Based	708	3.97983	0.501863	0.018861
SO	40	4.18328	0.512419	0.081021
PO	12	4.61693	0.393123	0.113485
Total	760	4.00060	0.508438	0.018443

The Levene's statistic was not significant at p=0.357 indicating that we should not reject the null hypothesis of equal variances between groups. There was a statistically significant difference at the p<0.05 level in Safety Culture mean scores for the three groups [F(2, 759)=12.348, p=0.001]. The partial Eta squared was 0.032 which using Cohen's classification, relates to a small effect indicating the relative magnitude of the differences. The observed power computed at the 0.05 level was 1.000.

Tukey's Post-hoc tests indicated that there were two subsets within the data each with significantly different means. These are shown in Table 5-22 with the WB and SO groups forming the first subset, and the PO group in a subset of its own.

Table 5-22. Homogeneous subsets of the three role groups using the Safety Culture variable.

Safety culture

Tukey HSD[a,b]

Officers and Watch-based Staff	N	Subset for alpha = 0.05	
		1	2
Watch Based	708	3.97983	
SO	40	4.18328	
PO	12		4.61693
Sig.		0.291	1.000

Means for groups in homogeneous subsets are displayed.

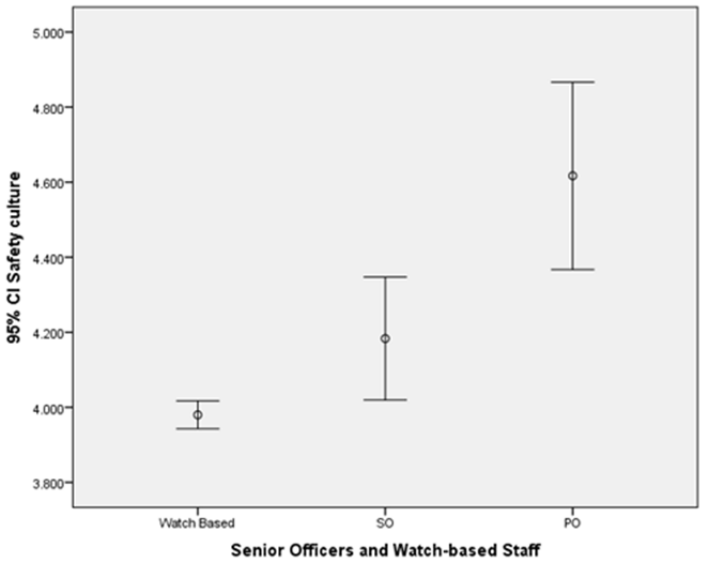
a. Uses Harmonic Mean Sample Size = 27.336.

b. The group sizes are unequal. The harmonic mean of the group sizes is used. Type I error levels are not guaranteed.

The 95% confidence interval of the median scores for each FRS is shown in Figure 5-21. From this we can observe that the confidence interval for the WB group is fairly small and compact in its spread when compared to the other two groups. There is only a very small overlap in confidence intervals between the SO and PO groups that does not encompass the mean score of the other group. What is evident from the error bar chart is that the largest group, WB (N=708), has the most concentrated confidence interval with a mean score that indicates a slightly negative attitude to safety culture within their FRSs. As we move up the hierarchy of roles and away from the exposure to everyday front-line firefighting the attitudes of both SOs (N=40) and POs (N=12) are more positive in their attitude to safety culture when compared to the WB group with the PO group being the most positive of the three groups. Note that the distance between the median scores of the WB and the SO groups is smaller than the gap between the SO and PO groups. The error bar chart in Figure 5-21 supports the results of the Tukey's post-hoc test.

Appendix 5-1 shows the results of the non-parametric tests of the four dimensions in relation to the concept of Safety Culture for comparison with the parametric results shown in this section.

Figure 5-21. Error bar showing the median and 95% confidence interval for each of the role groups for the Safety Culture variable.



5.2 Observations made at FRS stations

The three FRSs that took part in this part of the research have been assigned new designating letters, 'N', 'M', and 'T' to aid in maintaining their anonymity.

The researcher attended three FRSs where each FRS had selected a 'busy' station that could accommodate the researcher over the agreed time period. All three stations provided cover to both residential, light industry, commercial areas including shopping malls, and busy road networks, but only one station covered a motorway. The population served within the station area for each of the three stations were typical of most inner cities across England in that they consisted of a multicultural society and in the case of FRSs 'M' and 'T' extensive Asian communities. FRS 'N' appeared to have a larger number of retail shops, offices, and high rise flats of the type that reflects major redevelopment in the local area over the last thirty years. The station risk profile within FRS 'M' consisted of smaller residential properties with terraced houses of traditional brick and mortar construction, and in the high street shops with one or two floors of residential premises above them. In FRS 'T', the station was situated in a more leafy suburban area of detached and semi-detached properties on the outskirts of a busy commercial and residential area traditionally associated with the local high street in most English towns.

Having been given permission to undertake the research each FRS then appointed a liaison officer. The researcher stressed that he would only be present on the incident ground in a similar manner that members of other agencies, such as the utility companies would, i.e. one in which they would normally wear a bump hat for head protection, a hi-visibility jacket, stout footwear and some weather-proof clothing. That has always been found to be suitable for the risk as they only operate in areas that are very low risk and under the direction of operational FRS staff. The researcher's intentions were that he would not be carrying out his fieldwork in a risk area and would be observing from just forward of the 'crowd line' at an incident. On arriving in each FRS the researcher received a safety briefing and was requested to sign disclaimer forms. In FRSs 'N' and 'T' the researcher was issued full firefighting uniform as personal protective equipment (PPE) in compliance with the risk assessment conducted by each of the two FRSs. The researcher raised with the liaison officers whether there was a risk that the researcher could be mistaken as a firefighter, despite wearing an issued surcoat over the firefighting tunic with a designation of 'Observer' or similar label. This was taken back to their health and safety officers and their original risk assessment and the requirement to wear full firefighting uniform as risk mitigation was confirmed. This led to some problems at the incidents the researcher attended with station appliances as members of the public recognised the personnel protective equipment the researcher was wearing but did not look to see what was printed on the surcoat. The members of the public expected to see firefighters and with the researcher wearing the same PPE he met those expectations; to them the researcher was a firefighter and this did cause some difficulties. When attending calls the researcher would remain on the appliance while the crew dismounted and collected the equipment they needed before the researcher would dismount. In FRS 'M' an inspection was made of the researcher's own clothing, footwear, bump hat and hi-visibility surcoat and this was accepted as being adequate for the purpose.

The FRS is renowned for its extensive use of abbreviations and acronyms used for its appliances, equipment, and procedures attracting comments from outside organisations, researchers, and even coroners such as following the 7/7 bombings, as to the confusion it can generate. Generically, the term appliance tends to be used for any firefighting or rescue vehicle. Pumping appliances are now stowed with the same equipment and for those stations with two pumping appliances they tend to be referred to as 'Pump 1' and 'Pump 2'. The more common types of specialist appliances are 'TL'(

Turntable Ladder); 'HP' (Hydraulic Platform); 'ALP' (Aerial Ladder Platform), which are high-reach appliances that can extend their ladder or booms to approximately 30 metres; 'HVP' – High Volume Pump; and a Control Unit which is usually referred to in full or by the abbreviation 'CU' depending on the FRS. There are many more but these are the most common abbreviations based on the numbers of such appliances in each FRS. Attending an emergency can be referred to as any one of the following: a 'call', 'shout', job', incident', and may be more descriptive, for example, 'fire', 'RTA' (road traffic incident), 'makeup', 'relief'. A 'make-up' is gauged by the number of pumping appliances in attendance, for example a '4 pump fire', or a '15 pump fire', or a 'six pump RTC' (road traffic collision). As one firefighter remarked to the researcher "It's so much easier you having been in the job *(the FRS)* and us not having to continually explain what we are talking about" referring to their everyday use of language.

As each station is a WT station they have four shifts referred to as Watches. These are differentiated by colour so you have the Red, White, Blue, and Green Watches[11]. Shift patterns have now significantly changed across most FRSs following the recommendations of Bain et al. (2002). Each watch is led by a Watch Manager (WM) supported by a number of Crew Managers (CM) depending on the number of appliances allocated to that station. Both roles are responsible for supervising firefighters. The number of CMs and firefighters is dependent on the number of appliances based at the station. More detail on the different roles is available in Appendix 3. If the WM is unavailable due to sickness, leave or being on a course one of the CMs will assume the role of the Watch Manager for that period of time.

5.3 Fire and Rescue Service 'M'

The station the researcher was placed with was fairly new, having been built within the previous ten years and fitted with multiple appliance bays occupied by two pumping appliances and a special appliance. The main focus of the station was the general office located off a small corridor leading directly to the appliance bay. Opposite the general office was the 'gear room' for all four watches in which the personal protective equipment (PPE) such as fire helmet, anti-flashhood, tunic, fire trousers, and boots were stored. The PPE for the on-duty watch was kept on the appliance to which each firefighter had been allocated for that shift. The general office is the work area of the WB officers, and those

[11] Some FRSs adopted the colour Black instead of Green when FRSs introduced a fourth Watch.

with specific tasks that had been allocated to them to complete using one of a number of personal computers all linked to the centralised FRS server. Elsewhere on the ground floor were other offices, including that of the station manager, storerooms, and cleaning rooms where equipment could be cleaned and maintained. To the front of the station was a reception room where visitors could enter and wait before being met and escorted elsewhere on the station. The reception room and corridors across the station have framed pictures related to awards made to operational personnel by the Chief Fire Officer (CFO) or other bodies such as the RSPCA for actions carried out at incidents. There were also numerous framed pictures relating to incidents that the station's appliances and personnel had attended showing exciting scenes of flames thrusting out of windows and doorways, vast volumes of smoke being liberated from the confines of the building, and from road traffic collisions that showed people being rescued. There were also other pictures associated with previous eras showing firefighters in their brass helmets by steam driven or horse pulled fire engines. There were also epitaphs for fallen firefighters to remember them by. On the first floor there was a meeting room that doubled as a classroom for the firefighters that was equipped with whiteboards and overhead projection facilities. Further along the corridor were individual rooms each with a table, bed, and wardrobes where individuals could study, rest, and store spare uniform and their civilian clothing whilst they were on duty. Individual shower rooms and toilets in which firefighters could clean up after an incident were available along the length of the corridor. The use of individual gender-free washing and toilet facilities are standard in the design of any new station and older stations have gone through similar conversions to provide a similar accommodation. Some stations still have a number of small dorm rooms that might have beds for between two to six persons. The WM has a single room allocated which is located on the ground floor next to the general office. The first floor is where a kitchen, mess-room and a tv/lecture room are located. A daytime cook is employed by the FRS to work at the station. During normal duties on the station staff will use the stairs but if they are located on the first floor and the 'bells go down', more often a tannoy but firefighters still talk of the bells going down, it is normal to use the sliding pole.

The general office is also the area in which, following the change of watch, or on being re-assigned to another appliance individuals would come and sign the specific log-book for the breathing apparatus (BA) set that they would wear at an incident to record that the set had passed its start-up test, been closed down, and that the compressed air in the cylinder was

above the minimum level before the cylinder would have to be exchanged for a full cylinder.

Just inside the office is the teleprinter on which routine administrative messages can be circulated via the FRSs control room or the control room mobilises one or more of the station's appliances to an emergency call. A pumping appliance might also be mobilised to standby at another station to provide emergency cover if the appliance(s) from that station were attending an incident and likely to be there for some time.

Leading off the appliance bay into the station was a passage way which took you into the centre of the station and the stairway to the upper floor and the communicating corridors to the different facilities available on the station. Off the passageway from the appliance bay was access to a combined general office and the watch room. Further along was the WM's personal room for the use of this officer whilst on duty. A 'Watchroom' is where the appliances will be mobilised by teleprinter to attend emergency calls. The general office was fitted with a number of desks and there were four computers available on which at least two were generally in use for completing returns. FRS SOPs can be accessed from the FRS central server using one of the FRS personal computers across the station. The officer in charge of the Watch was a WM with over twenty-five years of service. He had spent most of his career as an operational firefighter although he had previously spent a number of years as a FRS instructor at the FRS training centre.

5.3.1 Management

In light of the potential for FRSs to become more risk averse in their operational duties, particularly after the events of Atherstone on Stour and the subsequent court case, POs in the FRS were pushing down the message to both SOs and WB staff that they and the FRA would support them in their decision-making should a similar event occur in their FRS. The general consensus on station was that they believed the CFO's message that he and the FRA would stand by them, demonstrating the level of trust and confidence the firefighters have in their CFO. This FRS had also taken a training package to stations where the Atherstone on Stour incident, and the decisions made were discussed in detail including the relationship between compliance and guidance regarding SOPs. WB staff thought it useful

and that it would be some particular SOs that would benefit the most from this additional training as they thought them more risk averse than themselves.

During the course of the researcher's time at the station the Station Manager was unavailable. The Watch was under the supervision of a WM and two CMs, the first CM was substantive and the other 'in development'. The substantive CM had over twenty years of operational experience. The second CM was in development i.e. he had passed the assessment centre for CM and was now in the process of accruing the evidence to demonstrate his/her competence in the role's specific elements before he could be made substantive as a vacancy occurred. The acting CM had over eleven years of operational experience. There was another firefighter on the Watch that alternated with the current acting CM as periods of acting up became available. This firefighter was part of a graduate/accelerated promotion programme and had been in the FRS for four years. The acting CM and one other firefighter on the Watch were both FRS trained breathing apparatus instructors.

Observing the two substantive WB officers, the researcher would identify them as being leaders using Hersey and Blanchard's (1977, in Trout, 1994) definition, in which management is described as being related to the accomplishment of the organisation's goals, whereas leadership relates to influencing the behaviour of others. Both officers had the respect of the firefighters based on their knowledge, skills and experience, inspiring trust and confidence on the incident ground.

Prior to the exchange of the on-coming and off-going Watches members of both Watches would start to congregate in the area of the station office where they would engage in conversation either work orientated, or just general conversation. At the change of watch, signalled by use of the tannoy, the personnel of both Watches would make their way to the appliance bay with the on-coming watch standing in a line, and the off-going Watch standing in the second line facing them. Once the on-coming WM had ensured he had sufficient crew to ride the station's appliances the off-going Watch would be dismissed and the on-coming Watch would be briefed. This formal parade was conducted with both Watches wearing work-wear uniform. The PPE of personnel riding the appliances would be on those appliances whilst the PPE of those about to relieve them would be laid out in close proximity to the appliance they expected to ride at the start of the Watch. The WM of the

on-coming Watch would stand in front of his Watch facing them and would detail which riders were assigned to which appliances. All of the individuals would know which appliance they were riding before this parade as that information was available on a board held in the station office. Some of the on-coming Watch would already be riding their appliance if asked by a member of the off-going Watch to allow them to get away early. The WM would give a general outline of what activities were planned for that duty shift and bring to the attention of the Watch any new risk critical information that the Watch personnel may not be aware of. On being dismissed from the parade the on-coming Watch would then proceed to their appliances where they would stow their PPE and then first check the equipment specific to their task, for example the designated appliance driver would check the level of fuel and the vehicle lights, including its blue-flashing beacons, whilst the breathing apparatus entry control officer (BAECO) would check the BA board, which would hold the tally with the BA wearer's role and name, and the time of entry into a building whilst wearing the BA set. The three things this individual was looking for when checking the board was the BA surcoat that was specific to that role consisting of a black and yellow chequered pattern, that the clock on the board's functioning and showed the correct time, and finally there was a chinagraph pencil with which to write additional details as required in the BA board. In the appliance bay on the wall between the bay and the general accommodation there were a number of documents available, all associated with specific risks, or new risk critical information that members across all four Watches could familiarise themselves with in their own time.

5.3.2 Procedures

During attendance at incidents it was noticed by the researcher that only the WM and the more experienced CM that would wear their full PPE, whilst the CM in development and other firefighters could be seen carrying their helmets over their arms by the helmet's chinstrap and not wearing their protective gloves. If they were deployed into a building as part of a BA crew then these were worn correctly. On asking the CM in development why he did not wear his full PPE the researcher found he was not even aware he had been doing it and was initially in denial until it was pointed out to him at subsequent incidents as it happened. On reflection he could only justify it by assuming it was because he found it easier to listen to what was going on around him than when he was wearing his fire helmet which covers the sides of the head and over the ears. Another firefighter just said that it

was more comfortable and he didn't believe he was at risk so he had relaxed his dress. When the researcher asked the WM about this he was aware of it but having had to keep addressing this had over time stopped picking up on it as there were other things he also needed to focus on at incidents. This provides a good example of Dekker's (2011b) 'drift into failure', or Rasmussen's 'drift into danger'.

At an external venue the researcher was able to observe a BA drill that was planned and managed by the two BA qualified instructors. The drill involved entering premises and searching for casualties in a sub-basement, i.e. two levels below the ground floor. During the drill both the BAECO and the nominated firefighter overseeing communications with the BA crews had decided not to wear their helmets which they would be expected to do in accordance with procedures. The BAECO position was established internally at the head of the staircase for the purpose of the exercise which operationally would be seen as an example of bad practice. Any worsening of the fire conditions due to a sudden escalation of the fire would only leave the staircase as a route for the resulting smoke and hot fire gases to escape which would have necessitated the re-positioning of the BEACO. This would have meant that when the BA crews withdrew it might be difficult to find its new location. The national policy on siting the BAECO position is that it should be in fresh air, easily seen, where the BAECO and any BA wearers at that location are not in physical danger. 'What you see, is what you do' as one firefighter described it in a later conversation. The danger is firefighters may well start to take these adopted habits from the drill ground to the incident ground if the incident appears to be a "nothing job", and especially during inclement weather. As a SO said to the researcher "what gets excepted then becomes accepted until finally, it's expected." During the exercise one BA crew used their anti-flash hoods to wrap around their visors to reduce their visibility for the purpose of the exercise and to simulate a smoke filled atmosphere. Again, this practice is against policy as when wearing BA it should be worn up over the straps holding the BA face mask to the face in case the crew members are caught in a flashover or more likely a backdraught[12]. At other times it should be worn around the neck acting as a protective scarf to stop embers entering the neck of

[12] A backdraught relates to unburnt fire gases that have accumulated in an oxygen deficient atmosphere that when suddenly exposed to oxygen when a compartment is entered will lead to a sudden deflagration that will move across the affected compartment and out of the opening.

the fire tunic[13] this is an important part of the firefighter's PPE. At the end of the exercise a hot debrief, that is immediately after the exercise or incident, was held by the two BA instructors who criticised a failure to comply with the FRS policy when searching in smoke in that one individual allowed his hand to come away from the wall so he had lost contact with it; this was done as he turned to assist his colleague who was negotiating an obstacle with some difficulty. The researcher later spoke to the substantive CM about this in a series of 'what-if' scenarios and his view was that the BA instructors were technically right as it was against policy, but it was always going to happen even in the best of circumstances during a real incident. We then discussed BA crews clipping-on and clipping-off the BA guideline when descending the stairs and the extensive amount of time it took to get to the bottom of the stairs to begin their search for the persons reported missing. A BA guideline is a means to traverse a complex layout showing the route in and the route out and is laid by the initial crews on the incident commander's instructions. The substantive CM and two other firefighters all said that it doesn't happen in reality "but we have to do it for drills" so as to show competence. The researcher also spoke to the BA instructors and asked about the range of personal experience they had at this type of incident. It transpired that their knowledge was theoretical and experience based on station exercises rather than practical experience.

Firefighters were not the only FRS personnel not to be wearing their PPE correctly. At a road traffic collision (RTC) incident involving two cars a SO attended and whilst the crews of both appliances were wearing full PPE and hi-visibility surcoats the SO was in the immediate area of operations wearing just a shirt, trousers, shoes and a hi-visibility surcoat. As one firefighter quietly remarked out of earshot of the SO "Do as I say not as I do!" This is not the behaviour the researcher had expected to witness, certainly not of officers, who are expected to lead by example.

5.3.3 Competence

The WM benefits from having gained experience over a period of approximately 25 years, having served most of his career in the operations function. He is a qualified FRS trainer, having been reluctantly posted into that function, and had served at the FRS training centre

[13] This can vary between FRSs depending on whether the fire tunic has a full collar that can be secured in the upright position or if it is the shorter version that would provide no protection to the neck area.

for a number of years. The more senior CM informed me the WM was well respected as a trainer, being able to bring his own operational experience on the incident ground into his training delivery. The substantive CM had only ever served in the operations function of the FRS during which time he had gathered a wealth of practical knowledge and experience, which he demonstrated practically to the Watch both during training and at incidents, and was able to refer to in subsequent discussions with the researcher.

One way to engage with firefighters has always been to share experiences of previous incidents, storytelling, particularly if they are well known incidents, or were of particular note for some event that occurred that was either funny or potentially a near-miss to an accident occurring. Initially, the researcher thought individuals were reticent as a group but even in smaller groups, or in one-to-one conversations they appeared not to engage. Talking with the WB officers, and different firefighters it became apparent that for many the only stories they would have to offer would be second-hand accounts. This reflected not only the reduced number of calls they have attended over the last decade but the nature and size of those incidents.

In a discussion with the WM and the substantive CM late one night the subject of rapid promotions some individuals had received in a relatively short period of time was raised by both officers. They spoke of the old system of where a recruit came to a station and was on probation for the first year having to take two assessments, and then it was a further three years before you could become a qualified firefighter having taken a further assessment; it was very similar to undertaking a four-year apprenticeship. The researcher then asked them about the process under the Integrated Personnel Development System (IPDS). They explained that as soon as an individual could demonstrate competence in the workplace in their current role they could apply for the assessment centre for the next role. If successful they would be on a development programme and having demonstrated competence in their new role they would then be made substantive as a position arose. On further discussions about the competence process with the WB officers they believe there is a problem with the process as the system only records the one time that a successful outcome was achieved with no indications of how many times an individual might have failed before reaching the required standard. This was quite a common statement made by WB staff in all FRSs. The general consensus was that competence was the right approach to

take in training but the system was very bureaucratic, time-consuming, and thought of as an administrative burden but just one of those things you have to do.

The WM and the substantive CM expressed concerns regarding the loss of experience as older members retired. Neither believed that simulations in their current format could provide that level of experience to a new generation of firefighter. This was also linked to what they thought were the number of SOs that were being promoted but lacked the relevant operational experience. When asked about risk aversion, different members of the watch, on different occasions, thought in general that SOs were more risk averse than WB staff.

Firefighters informed the researcher that the risk aversion they believed prevalent amongst certain SOs has led to a tendency to try and get things done before the SO arrives and puts them into a defensive mode that they think the risk exposure does not warrant. This is something that has been mentioned to the researcher by personnel from other FRSs in focus groups whilst conducting fieldwork during an earlier phase of this research.

Based on the researcher's operational career in the FRS, personnel of this Watch appear to be well motivated, they were led by a WM that remained self-motivated with the keenness that belied the fact he was coming to the end of his career. His knowledge of the equipment carried on his station's appliances was better or as good as those who would be expected to operate it at an incident. There was only one incident of any note during the researcher's time with this Watch, which was a relatively small fire, but behind the cause of that fire there was a potentially serious hazard. The WM gave a sense of confidence to his Watch by the manner in which he conducted himself on the incident ground. The researcher could see that his firefighters trusted him and his judgement. What was missing, and the researcher was looking for in his observations, were the small touches that signify to the researcher the added 'professionalism' that comes with experience such as the development of 'on-arrival' tactics to be employed by the Watch. This includes things like the siting of the appliances, which with a well-trained Watch, the drivers of those appliances will take responsibility for. Well practised appliance crews will pick-up the same visual cues as the appliance commander and using their well-practised 'on-arrival' tactics developed by the Watch, they will automatically know what was required of them at that type of incident. The appliance commander would only need to confirm or stop that activity

if there was a particular reason that gives, certainly to the first incident commander, the opportunity to 'collect themselves' and provide a little bit of thinking time. As the number of incidents was small and none were of note, and the drills were focused more on the technical aspects of specialised equipment there was very little opportunity to observe and look further for these 'on-arrival' tactics. What the researcher did was talk to individuals on the Watch and ask questions around this subject and then match their responses. The researcher concluded that although individual members of staff had an appreciation of what might be required of them it was not part of a planned team response.

There was one firefighter who was relatively inexperienced and was on an accelerated promotion programme. Both of the experienced WB officers explained following a potential near-miss at an incident involving this individual that this was not an isolated event and that reflected on the individual firefighter's lack of experience and the limited ability to make risk assessments on the incident ground. In the office environment the firefighter was acknowledged as being very good at record keeping and the administrative tasks which they expected due to this firefighter's previous experience as a junior manager from a previous occupation. However, both WB officers were expecting to be reported by the firefighter at some time in the near future on the basis of equality and diversity as the firefighter is confident of his/her levels of competence and was being deliberately held back unnecessarily by the WB officers. Both officers expressed a lack of confidence in their FRS management that they would be supported should a complaint be made. During further drills conducted by the Watch and observed by the researcher the performance of this firefighter would suggest that some competence issues remain still to be addressed particularly when compared with other firefighters on the Watch.

At one particular incident the researcher asked why the WM had stopped his appliance immediately outside of the premises they had been called to. The WM spoke of trying to keep the road open to traffic although it was past the morning rush hour period. It has always been seen as good practice for the first appliance to pull beyond the frontage of the building involved so as to allow the ladders to be pulled off and deployed straight to the front of the building. The second appliance would stop short of the building, or might be deployed to the side or rear of the premises. By keeping the front of the premises clear of appliances then should the fire develop, or there are signs of potential collapse of the structure or a part of it, there is no requirement to move appliances. Repositioning

appliances often involves the disconnection of hose lines, lighting cables and the repositioning of control points and disrupting planned operations. Leaving this space free provides room for the use of an aerial appliance if required or for an ambulance if required. This is why many officers use the term 'siting' appliances as opposed to 'parking' them. This is not covered in any depth within FRS guidance but is typically something that has been passed down by experienced supervisory officers and the more experienced firefighters. It was noted that at all incidents the researcher attended with the three FRSs the siting of appliances seemed to be secondary to parking them so they were available for a quick getaway, and back to the station, once the 'Stop' message[14] had been sent.

Whilst the firefighters were working in the appliance bay the researcher noted the interactions between the more experienced firefighters, those with some experience, and the newer firefighters with limited experience although they had been firefighters for at least four years. With the WB officers being occupied for most of their time in the general office completing returns and paperwork the senior hands, i.e. the more experienced firefighters, in the past would provide a form of mentoring including a wider range of practical use of equipment in an operational environment. This provided informal training that supplemented the formal drill periods. There was no evidence of this mentoring taking place on the Watch. This was discussed with the WB officers and it was thought that it was probably the result of competence training being focussed on the individual and the previous informal role of experienced firefighters acting as mentors no longer being recognised. These changes were attributed by this firefighter and a colleague to the focus on individual competence training for the individual which doesn't cover, in their opinion, the real-world use of equipment and procedures. In their experience, the role of mentoring by senior hands provided the one-to-one training and a transfer of knowledge and skills that they believe is now missing. They also mentioned that the new generation of firefighters did not seem to value what they could learn from the older firefighters and were more focussed on just doing enough to complete their competence portfolios under IPDS. This is similar to the student that just wants sufficient knowledge to pass the exam and not how that knowledge might be used in a wider and more practical context.

[14] A 'Stop' message informs the FRS control that no further resources will be required at that incident.

5.3.4 Work pressures

The modernisation programme included financing and overall management of the national programme of Home Fire Risk Checks (HFRC) in England. Different titles for this programme may be found being used across different FRSs. The programme involved FRSs attending premises in high-risk areas and providing advice and one or more 10-year battery operated smoke alarms free of charge. This has been a successful programme, and the benefits had been confirmed by external consultants, which has seen the number of calls to the FRS decline, which station personnel believe is in the region of a 50% decrease; of the remaining fire calls to residential properties people are being alerted earlier so have the opportunity to exit the premises unaided before a fire becomes too developed; the FRS is called earlier; the fire is extinguished while it remains a relatively small fire often confined to the room of origin.

This station was fully occupied in HFRC work, yet found the time to conduct drill sessions both on and off the station, with any 'slack' time being taken up with further HFRC visits. The researcher wondered initially if this was for his benefit but the reaction of the firefighters indicated that this was part of their normal station activities.

5.4 Fire and Rescue Service 'N'

The station the researcher was placed at was fairly new, having been built within the previous ten years and fitted with multiple appliance bays occupied by two pumping appliances and a special appliance. The functionality of the station and its layout is very similar to the station visited in FRS 'M'. Just prior to the change of Watch, between the on-coming Watch and the off-going Watch, the station office becomes the main focus and where information is being exchanged between appliance drivers regarding any minor defects or issues relating to the equipment they carry; the WB officers due to go off-duty give a summary of what has happened during the previous tour of duty to the on-coming Watch officers. At the change of Watch the on-coming Watch parade at the rear of their appliances in a single line wearing their work wear uniform where their riding positions on what appliances and any specialist functions are allocated, such as the nominated BAECO for each appliance being confirmed. Although relaxed, this is still part of a formal process. Summary details of any outside visits, activities on the station, or new operational instructions are announced. Once dismissed all members of the Watch place their PPE on

their nominated appliance and proceed to test their allocated BA sets. If there are more than two firefighters on the rear of a pumping appliance, which has four rider positions for firefighters, the outside positions are the more favoured as it means less jostling between firefighters as they put their PPE on. On some watches they have put the forethought into seating positions by designating those firefighters nominated to form the first BA crew to occupy the centre seat positions. This is so that as they put on their BA sets they don't obstruct the other two firefighters from leaving the appliance to carry out other tasks. As one firefighter said, this is no longer a problem as they rarely have more than two firefighters in the back. The firefighters of the on-coming Watch then head to the office to sign the BA log book for the BA set they have taken over before returning to their designated appliance to check the appliance and its inventory of equipment.

In the appliance bay there are mementos of a previous era linking the current new station to those stations that have since been decommissioned and whose history it has absorbed as they were closed. These mementos include one specific plaque to all the firefighters from that station that died at incidents going back to a pre-war era. Other plaques relate to individuals that died at separate incidents. Just off the appliance bay in the corridor leading to the depths of the station accommodation there is a framed picture of a Victorian fireman rescuing a young girl from a burning building and a more modern picture of firefighters using firefighting jets on a large fire; all vivid and powerful images portraying firefighters in an heroic role.

5.4.1 Management

Station personnel were aware that POs were trying to reassure them that the FRS would support them in the event of them facing an enquiry following an incident at which firefighters were injured. However, the firefighters were not confident that this support would be forthcoming in reality if the likes of Atherstone on Stour were to occur in their FRS. As one firefighter said "We'll just have to wait and see" indicating there was an issue regarding trust between firefighters and FRS management.

The WM has been in the FRS for over twenty-five years, most of which he has been an operational officer, although he had previously been an FRS instructor at the training centre. The WM was supported by two CMs both of whom are firefighters temporarily

promoted to cover vacancies caused by the posts not having been filled, sickness, or the post-holder being on a course. One CM was a firefighter of 26 years operational experience all at some of his FRS's busiest stations. The second CM had 11 years operational experience. Although this CM works in this FRS as a WT firefighter he is also an OC firefighter in a second FRS in whose area he lives.

During the time in this FRS conducting fieldwork, the researcher saw the SM three times in passing in the corridor between his office and the station's general office and he expressed his keenness in meeting with the researcher and scheduled a date and a time for a meeting. This was cancelled by the SM and another time slot arranged instead but the SM did not attend this second meeting either and he was not seen or heard from again by the researcher before the end of the fieldwork.

The researcher was discussing with a firefighter with ten years of experience the difference between leaders, managers and the promotion system under IPDS. He raised the subject of a recent SM that he had worked for at the same station. This SM had managed his station by email and he was rarely seen except on arrival, or when departing the station. Although the SM's office was adjacent to the station office where the WB officers were located, the SM rarely conversed with or met WB staff or officers face-to-face but would issue instructions by email from his office. This SM was apparently highly thought of for his managerial talents and administrative skills by SOs that rarely visited the station themselves. This particular officer was not renowned as being one of the best incident commanders in this FRS as was confirmed in conversations between the researcher and firefighters from adjacent stations when his name would be offered by firefighters and the supervisory officers as an example of a manager as opposed to a leader..

5.4.2 Procedures

Observations were made of the firefighters conducting their pre-checks of equipment at the change of watch and how consistently thorough they were across the period of the fieldwork. In the researcher's experience there is normally a rush to get these done so they can get a cup of tea before commencing the shift's activities. The fact that this did not occur is a reflection of the standards set and the expectations of the WM to the point that it is part of the established culture of the Watch.

Although the researcher attended a number of incidents with the Watch they were only to small incidents, usually involving smoke alarms actuating. Of note was the general expectation that the calls they were attending were unlikely to be anything serious and this could be observed in their lack of preparedness with helmets not being worn but carried by the chin strap, PPE tunics remaining unfastened, and again the parking of appliances on arrival in forethought of getting back to the station once the Stop message has been sent.

5.4.3 Competence

The WM was an experienced officer with only a few years left before retirement and had a very good reputation as an incident commander on the incident ground. He, like the WMs in the other two FRSs, had previously been an instructor in his FRS. He had also previously undertaken the role of a Station Manager (SM) so had understanding of the differences between that and his current role. During the researcher's stay with this Watch there were no fire calls, except one to a motorcycle alight in the early hours of one morning, to make observations regarding the competence of the Watch at incidents. There were only three drill sessions in the station yard and no exercises that the Watch participated in during that same period. None of these drills were observed or attended by the WM, one drill session was arranged by a substantive WM from another station who was standing by in the absence of the local WM. This standby WM had arranged for an experienced aerial appliance operator/driver who had instructional experience to be in attendance at the station and to take the crews through various drills and evolutions in the use of this specialist appliance based at this station. Although individuals at the station had received training in the use of this appliance by their FRS, station personnel thought the training was minimal and basic. The purpose of this experienced operator attending was to provide that additional knowledge and share his experience in handling the appliance across a wider range of activities. This had been arranged locally on the Watch and not arranged by the FRS. The first BA drill involved the use of BA guidelines, within the confines of the station's appliance bay, which was very low-key and appeared to be arranged more on the necessity to conduct a test of BA sets as they had not been worn operationally or during training or drills within the prescribed period of time in accordance with FRS and national policy. In general, the level of training activities was minimal and the researcher would question if it was sufficient to maintain skill levels.

The researcher witnessed three station drills while conducting his fieldwork at this station. The first was a BA drill using an appliance, a hose line, and a BA guideline. The second involved the use of an aerial appliance to give personnel the opportunity to familiarise themselves with working with this specialist appliance. The third involved a small BA drill in a BA facility at this station. Other than these drills, training was extensively reliant on the individual's self-motivation as evidenced when the researcher found three firefighters on their own in the station yard with lines of hose laid out where they had been practising the most effective way to deploy them in different circumstances. Training seems to be heavily based on the use of computer training packages and multiple choice questions. There was a distinct lack of focus being paid to team working and continued practice using the equipment in practical scenarios. When asked if there was a role for 'senior hands' in training the researcher was told by those senior hands that it just doesn't happen anymore; there is no place for senior hands in the role maps, and that a younger generation of firefighters places little value on their accumulated experience.

The only person that would engage in 'story-telling' was the long-serving temporary CM and whilst this was occurring two firefighters sat in and listened to his experiences as he recounted them. When asked why others didn't contribute their own stories of incidents and events he pointed out that "we just don't get those sort of jobs anymore" with reference to the type and size of incidents. We also spoke about recruitment and how in the past the FRS used to recruit from the Armed Forces and particularly those who had trade qualifications. The CM said that those skills, those trades, were still there on the Watch and things hadn't changed substantially over the time from when he first joined. He recalled some of those individuals that he used to work with before they retired and the different skill sets they had. The researcher then asked the CM what skill sets he recognised that were available on his Watch. He paused, thought about it, and then laughed and said he couldn't think of one. He appreciated that this availability of additional skill sets to the FRS was declining but had not realised the extent to which that had happened on his own Watch.

5.4.4 Work pressures

The station had almost no workload associated with community fire safety initiatives although apparently they did have over previous years. The WB officers and the firefighters

all agree that the FRS focus has been on community fire safety since modernisation, and station training has been greatly reduced as a result. The issue which was evident at this station is that the bureaucracy and administrative workload is confining the WB officers to the station office whilst the firefighters, who have the time to drill practice or improve their skills, have no WB officers available to supervise them. This is not a new problem as in the past the high volume of emergency calls had the same effect with extensive fire reports to be completed, particularly in the days before personal computers were available on stations. The difference was that WB staff were using their equipment and putting into practice their learned skills on the incident ground. That has not been the case with CFS initiatives based on the change in role of the FRS following modernisation. With the reduced CFS workload the firefighters now have the time available to focus on their training and improve their skill sets. Under the WM of FRS 'M' that Watch has grasped that opportunity and then knowledge and skill levels are easily observed. This Watch has a WM that does have the knowledge and experience to pass on to them but for some reason the WM seemed occupied with other things.

5.5 Fire and Rescue Service 'T'

The selected station was located in the middle of a residential area consisting of detached or semi-detached houses associated more with a suburban area. The station dates back to the 1970's and has two pumps and a specialist appliance. Where the FRS has attempted to maximise the use of space, the pumping appliances when returning to the station have to be reversed into their appliance bays as the rear of the bays have been converted into training or community rooms. The specialist appliance can still be driven into the station drill yard and into the rear of the appliance bay. In the station yard is a drill tower used for pitching ladders and conducting drills at height either via the ladders or by internal staircase. There is a BA facility to the rear of the yard and offices for community fire safety who have their own staff on non-operational duties. At ground floor level immediately adjacent to the appliance bay is a compact general office with three desks, one for each of the supervisory officers with two desktop computers shared between them. At the rear of the appliance bay is a corridor that leads to two large meeting areas and a smaller room which contains a number of desktop computers all linked to the FRS main server. To the left of the corridor is the gear room where the PPE of the off-duty personnel is held. Access to the station is via the front door that opens into a reception area from which are two

corridors. One leads to the general office and the appliance bay, the other leads to a series of individual rooms used by the junior officers as their rest rooms, each with a bed and lockers. The WM's room also acts as his private office. The SM's room is also located along this corridor. From the reception area there is a staircase leading to further rooms on the first floor where the firefighters can rest during the early hours of the morning, each with its own bed and lockers. There is also a mess *(dining)* room and kitchen area on this floor.

5.5.1 Management

The FRS's POs have made it known to operational personnel of all ranks that that the FRS will support them should a similar situation arise in their FRS as happened at Atherstone on Stour. The WB staff expressed to the researcher their doubts as to whether this would actually be the case based on a previous incident. This was when the FRS had declined to support a firefighter against whom a complaint had been made by a member of the public and was subsequently found to have been falsely accused, leaving a level of mistrust between station personnel and the FRS management. The SM was only seen twice at the station and although the researcher had been told by the SM that he would make time for an interview this never came to fruition due the SM's off-station activities. This was also the situation with the WM in that the interview never took place despite a number of requests to identify when that might occur as the WM couldn't find the time and often worked behind his closed office door. The researcher was aware that although he had received permission to conduct this research within the FRS by the CFO another PO with direct influence over operational personnel was reluctant that it should be taking place.

The WM is a relatively young officer who has quickly gained promotion having previously been an FRS instructor. His Watch believe him to be a high-flyer by the FRS which would mean he would be likely to move through the different roles to SO level fairly quickly. They are also aware that he has limited operational experience and believe that is why he has been posted to the Watch at what is considered one of the busier stations in the FRS. One individual remarked to the researcher, what does he bring to the Watch? The two CMs were both acting up in the role, one for a substantive CM on the Watch who was posted temporarily elsewhere, the other for a vacancy that had yet to be filled.

5.5.2 Procedures

The incidents attended by the Watch were relatively small, the same as the researcher experienced in the other two FRSs. On the first day there was quite an air of excitement regarding a recent incident, a fire they had attended on the previous shift, and it was explained to the researcher that it was a shame the researcher had missed it. On sitting down with some of the firefighters and asking them about it, it was a small fire in a kitchen quickly put out and the smoke vented. This was an early indication to the researcher of just how the reduction in the number of calls and the size and type of incidents has impacted on FRSs in that a fairly small incident could cause this level of excitement. One way to discern a 'working' fire station is that as soon as you walk into the appliance bay or anywhere near the gear room where firefighters' PPE is located you can smell the residual smoke from 'working jobs' they have attended. Whilst observing at all three fire stations in the participating FRSs the researcher noticed that there was never this smell that lingers for weeks on the appliances and in the gear room despite the PPE having been cleaned.

5.5.3 Competence

Competence was not seen as something that members of the Watch believed could be gained purely by training, and officers and firefighters are taking many years longer than before to gain that experience. The practical experience that is available tends to be confined to single room jobs with firefighters and WB officers having a limited exposure to larger incidents and of different types. How can this lack of opportunity to gain experience be redressed? This was asked of a number of firefighters and their view was that training had to be more realistic and involve the regular use of a firehouse where fires could be safely controlled to expose crews to circumstances in which they could utilise their acquired knowledge and skills in practical scenarios based on real incidents to gain the necessary experience to fight fires safely. Many FRSs have at least one such facility available to them but the major issue for these FRSs is the small throughput of staff in their use. WB staff informed the researcher that these facilities are fine but in reality it could be years before you next have the opportunity to use them. The use of real-fire training was an issue that was identified as a potential contributory cause to the two firefighter fatalities at Shirley Towers in Hampshire FRS. As one PO informed the researcher there were questions why crews involved at this incident hadn't used the jet of water available to them to

extinguish the fire. As the PO said at some stage or other you have to put the fire out and not keep waving the jet around using the pulsing technique. It had been identified that in real-fire training crews had not been allowed to extinguish the fire because it took too long to set up the scenario for the next crew. One might argue that the training had become process driven rather than outcome based. The WB staff spoke of more realistic training and exposure to calculated risk taking, but would that be allowed? They thought it would probably never happen as the SOs seem to be risk averse by nature so they would never allow it. This might be an exaggeration but it certainly raises the point regarding the training, and experience required in planning and arranging these types of scenario, and being able to provide this type of exposure to allow operational staff to benefit from it at optimal, rather than just sufficient, intervals so that personnel can benefit from the experience.

Risk aversion is seen as an issue by WB staff and they attribute that to a blame culture, not only in their own FRS but elsewhere such as the justice system and the HSE. This has made people frightened to make decisions and as one firefighter said the level of accountability "frightens me; I now have doubts whether to progress *(advance a hose line into an incident, ventilate, or to search)"*. Another firefighter said this concern of being held to account in a court of law "affects all ranks *(roles)* in the same way… we're only going to get more and more defensive *(in tackling fires)*". A further firefighter said he was aware that crews of the first appliances attending were trying to get done as much as they could before the arrival of SOs whose instinct is to withdraw everybody and use defensive tactics.

Competence of operational personnel is measured by a software programme on the FRS server that is used to record details of training, and assessments usually comprising of multiple choice questions. The role of the SM and the four WMs, and their responsibility for the training of firefighters and WB officers at the station appears to have been diminished and it now appears to be the responsibility of the individual with records being centralised. In regards to the software programme in use, "It logs the drills that you've done but doesn't allow for the quality or how well it was done" (comments of a firefighter), or as another firefighter said the "training records are probably not very accurate" in that they did not reflect the true level of competence.

In trying to get WB staff to talk about previous incidents they had attended, or stories that they had heard, the older firefighters with 20 years or more in the FRS would readily engage in these conversations trading stories that didn't always involve themselves (i.e. they were second-hand stories) and would usually have a learning point to that story often made in a humorous fashion. An example at one station was at a fire in which two firefighters were extinguishing hotspots (damping down hot embers) and cutting away at floorboards after a fire. Another firefighter, who had a reputation of rushing around the incident ground, came hurtling into the room at speed without pausing to take stock of the situation. As a result he fell between the exposed floor joists where floorboards had been cut away and his legs went through the plasterboard ceiling below much to the amusement of the two firefighters in the room, and to the firefighters in the room below where you could only see a pair of legs kicking away from the ceiling above them. This particular firefighter hoping to recover the situation quickly heaved himself back onto the joists and as quickly as he entered the room, exited the room hoping that nobody had noticed. From this one event this firefighter earned himself the nickname 'Billy whizz'. The moral of the story, the learning point, is that you need to be aware of the situation before you take action. As the firefighter said in telling this story, there is a second learning point in that if you drop yourself in it, make sure it's not in front of an audience.

5.5.4 Work pressures

Work pressures associated with activities other than attending operational incidents did not seem to be an issue at this station. There was ample time to use for practical training and the researcher thought that as the WM had not long been on the Watch following his posting from the FRS training centre that he would have used the opportunity to impart his skills and knowledge, certainly in the area of training delivery, for the benefit of his watch, which would entail a reciprocal exchange with the experienced firefighters for him to learn from their experiences. It would also allow him to gain an overview of the competence of individuals and their ability to operate in teams. With two temporary CMs there was the opportunity to help develop them by providing guidance and mentoring. Although station drills have been described as being repetitive, they are only limited by the imagination and motivation of the WB officers and staff. This was a Watch that at regular intervals liked to inform the researcher of their 'experience' but it was evident to the researcher that their

behaviour was ‘drifting’ from what Rasmussen (1997) describes as the perceived boundary of acceptable performance and might be described as currently living on their reputation.

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Chapter 6 Discussion

The question we might ask is what, if any, were the changes or events that have occurred that might have contributed to this sudden increase in firefighter deaths? The first part of this chapter addresses the research questions. It then looks at the historical context of the FRS, including the development of fire legislation in England that contributed to the safety of firefighters and members of the public as part of FRS modernisation. It then moves on to look at each of the areas that evolved from the four dimensions of the safety culture. The first being management at both the national level and then at the local level, leadership, audit and assurance, the distribution of risk and rewards, and trust and confidence. The chapter then looks at the second dimension, that of procedures and their use both on the incident ground, at exercises and simulations, and decision-making. The third dimension is that of competence and looks at the expectations of the HSE, the Integrated Personal Development System (IPDS), the role of experience, and the use of computer based simulations, assessments and station drills. The chapter then moves on to the fourth dimension, that of work pressures and how it impacts on senior officers, junior officers and firefighters that may affect their ability to prepare for emergency incidents, and finally, decision-making and actions on the incident ground.

6.1 Answering the research questions

The principal research question asked: How does safety culture manifest itself in the English Fire and Rescue Service (FRS) and what are its implications?

This was then broken down into four sub-questions:

- What are the artefacts of the safety culture in the FRS?
- What are the beliefs and values of operational staff in regard to the FRS safety culture?
- What are the underlying assumptions affecting the safety culture of firefighters in the selected FRSs?

- What are the influences affecting the perceptions of key stakeholders of operational risk to FRS operational personnel?

Each of these questions is addressed separately in the following sections. The order of the first three sub-section questions has been reversed to first address the basic underlying assumptions from which the beliefs and values were derived, before moving onto the artefacts that reflect those beliefs and values. The results of the analysis of the responses to the safety culture questionnaire indicated that there were eight questions that were found to have cross-cutting themes between the five FRSs, and the three role groups. These are summarised in the following sections.

6.1.1 What are the underlying assumptions affecting the safety culture of firefighters in the selected FRSs?

The basic underlying assumption that was made quite clear to the researcher was to do with the official change in the FRS philosophy in 2004, as part of the modernisation of the FRS, from one of carrying out rescues and fighting fires to that of preventing fires. The majority of operational staff, certainly at station level, and unofficially voiced by some senior officers (SO), was that they would remain focused on what they saw as their primary task, their operational commitment to fight fires, conduct recues and in meeting the demands associated with the wider range of operational incidents they may be called upon to attend. Many referred the researcher to the title of their organisation and its role, i.e. fire and rescue service.

The safety culture questionnaire addressed a further key FRS assumption in asking respondents, in Question 30, whether they believed the priority for their FRS is the safety of firefighters on the incident ground. The boxplot for the three role groups indicated that all three groups, with the exception of a number of outliers predominantly from the WB group, exhibited an overall positive attitude towards the statement. This included 74.3% of WB staff; thirty-six of forty-two SOs; and all thirteen respondents of the PO group; the remaining staff expressed no opinion. Conducting a Kruskal-Wallis test of the data it was found that there was a statistically significant difference across the three role groups at the 0.05 level of significance (X^2=38.601, df=2, Asymp.Sig.=0.001). A series of Mann-Whitney tests were then conducted which identified that all three groups were significantly different from each other. The PO group, with a mean rank score of 673.04, had the highest score in

support of the statement, followed by the SO group (549.76), and the lowest score was that of the WB group (391.97). This difference in scores between the three groups appeared to reflect the role each has in in their respective FRSs. Using Schein's (2010) three generic subcultures the PO group are the executive group which develops and owns the FRS's mission statement and the resulting organisational policies. They have had to manage the implementation of the austerity cutbacks resulting from central government policies that Fire and Rescue Authorities have had to act on. These policies have resulted in the closure of fire stations, the loss of appliances, the loss of firefighter and officer posts, and the gradual change from WT firefighter posts to OC firefighter posts. With this there has been a trend of increased attendance times, from the point of when the FRS has received an emergency call and firefighters have arrived in attendance at the incident, due to the closure of fire stations resulting in increased travel distances. As a consequence those making up the first crew(s) in attendance believe they are faced with having to accept higher levels of risk and being unable to comply with procedures, as they do not have the immediate support from other appliances and their crews that would have been available in the past.

The researcher has associated the design subculture with the SO group as it is they who will design and establish the appropriate temporary structure, the selection and sequence of operational procedures to be used at an incident, and the appropriate level of resourcing required. The operator subculture refers to the WB staff and are those that have to implement and work to the structure and the selected procedures adopted by the SO for each incident. The PO group operate for the most part on the 'cold' side of the FRS, so they are reliant on monitoring by the SO group regarding issues around the use and the appropriateness of FRS policies and procedures. The SO group are the incident commanders who have to balance meeting public expectations within the policies and procedures set by the PO group whilst managing the risk-taking behaviour of some WB staff. Finally, there is the WB group who face the real risks of physical injury and being held to account in a court of law for their decisions and subsequent actions on the incident ground. It is often this group that will take a more liberal, or a more pragmatic approach to the role of procedures regarding them as providing guidance rather than them dictating how a complex and complicated incident should be resolved.

When using the five FRSs as the independent variable for this question the Kruskal-Wallis test statistic was X^2=10.689, df=4, Asymp.Sig.=0.030 indicating there was a statistically significant difference in mean rank scores across the five FRSs. A boxplot indicated that the median values of the five FRSs were between 5 and 6, with the minimum value being 4 indicating the overall positive attitude of staff in each FRS towards the statement. A series of Mann-Whitney tests indicated that there was a statistically significant difference between FRS 3 and FRSs 2, 4, and 5. There was no significant difference between FRS 3 and 1, or between the other four FRSs. The mean rank scores suggested that FRS 2 (443.53) had the highest score in agreement with the statement; FRS 5 (418.53); FRS 4 (413.65), FRS 1 (392.98), and FRS 3 with lowest score (362.77).

What these statistical tests have identified is that in general the FRS staff are supportive of the basic underlying assumption that their FRS is concerned with the operational safety of their staff on the incident ground. However, the strength of that support is affected by the generic subculture of the individual as to whether they are an executive (PO), a designer (SO), or an operator (WB).

6.1.2 What are the beliefs and values of operational staff in regard to the FRS safety culture?

The values that the firefighters in the 21st Century hold are similar to those of previous generations of firefighters. Forty years ago these values were defined as aims: to save life; to protect property; and render humanitarian services. In the late 1990s, on the introduction of the Dynamic Risk Assessment, the following statements outlined the level of FRS risk tolerance on the incident ground:

> "We may risk our lives a lot, in a highly calculated manner, to protect saleable lives.
> We may risk our lives a little, in a highly calculated manner, to protect saleable property.
> We will not risk our lives at all for lives or property that are already lost."

In support of these statements the Foundation for Incident Command document (CFOA, 2015) highlights what is termed the firefighter safety maxim:

> "At every Incident the greater the potential benefit of fire and rescue actions, the greater the risk that is accepted by commanders and firefighters. Activities that

present a high risk to safety are limited to those that have the potential to save life or to prevent rapid and significant escalation of the incident."

The remainder of this section focuses on those questions that, following a statistical analysis, were found to be cross-cutting themes whether across the three role groups, or the five FRSs that formed the sub-units of analysis in this research.

The statement in Question 30 regarding the underlying assumption that the respondent's FRS prioritising the safety of firefighters on the incident ground was closely aligned to Question 22. This question asked the respondent for their attitude towards whether they believed that safety issues relating to firefighters on the incident ground are assigned a high priority within their FRS. The three role groups of PO, SO, and WB staff were in agreement with the statement although they had different shaped distributions indicating a varied strength of support. Boxplots of the three groups indicated that each had a positive attitude although the respondents of the WB group were more widely distributed than the SO and PO groups. A Kruskal-Wallis test found that there was a statistically significant difference between the groups (X^2=41.366, df=2, Asymp.Sig.=0.001). Conducting a series of Mann-Whitney tests indicated a statistically significant difference between all three groups. The PO group had the highest mean rank score (691.31) followed by the SO group (544.74), and finally, the WB group (392.83) with the lowest, indicating a lower level of support for the statement.

With regard to the five FRSs the boxplots showed that all five had a positive attitude to the statement with 50% of respondents having scored either a 5 or 6 on the 7-Likert scale for FRSs 2, 4, and 5 with their median score being 6. FRS 1 showed a positive skew to its distribution whilst FRS 3 showed a negative skew. A Kruskal-Wallis test of the mean scores showed that there was a statistically significant difference between the five FRSs (X^2=20.259, df=4, Asymp.Sig.=0.001). Subsequent Mann-Whitney tests identified there were no statistically significant differences between FRSs 1 and 3; 2 and 5; 3 and 4; and 4 and 5. FRS 2 had the highest mean rank score (456.06) suggesting its staff were more in agreement with the statement than those of the other FRSs; the lowest score was that of FRS 1 (344.70).

Question 10 asked respondent's whether their FRS was active in seeking to reduce risks to firefighters on the incident ground. Using the three role groups as the independent

variable, boxplots showed three different distribution shapes, although each FRS indicated an overall attitude that was supportive of the statement. The median point for the PO was at seven on the 7-Likert scale; that of the SO group was six with a positive skew; and that of the WB group was also six but with a negative skew. Using the Kruskal-Wallis test it was identified that there was a significant difference, (X^2=40.328, df=2, Asymp.Sig.=0.001), in the mean rank scores between the three role groups. A series of Mann-Whitney tests were then conducted which identified that all three groups were significantly different to each other with the PO group having the largest mean rank score (667.31), the SO group (553.04), and the WB group (392.78).

When using the five FRSs as the independent variable, the boxplots showed a visual difference between them, particularly the distributions of FRSs 2 and 3. A Kruskal-Wallis test confirmed that there was a significant difference across the five FRSs (X2=78.382, df=4, Asymp.Sig.=0.001). A series of Mann-Whitney tests indicated that there were no significant differences in the mean rank scores between FRS 1 (350.64) and 3 (292.61), or FRS 2 (490.25) and 5 (459.77), however, there were significant differences between the remaining combinations of FRSs with the mean rank scores for FRS 4 (407.15), and FRS 5 (459.77).

Question 9 asked the respondents their attitude towards whether having lots of safe working systems in place reduced the likelihood of an accident. The overall response indicated a positive attitude towards the statement; however, 25% of WB respondents gave a negative response to the statement. Conducting a one-way between-groups analysis of variance indicated that there were statistically significant differences at the $p<0.05$ level in scores between the three role groups: F(2, 808)=5.773, p=0.014. Post-hoc comparisons using the Tukey HSD test indicated that the WB group (M=5.07, SD=1.482) was significantly different from the SO group (M=5.17, SD=1.482) and the PO group (M=6.46, SD=0.660). There was no significant difference between the SO and the PO groups. The results of non-parametric tests confirmed these findings and suggest that FRS staff are in favour of having multiple safe systems of work being in operation.

When we look at the responses of staff from the five FRSs to question 9 the boxplots indicate that FRSs 1,2, and 4 have similar negatively skewed distributions and that, with the exception of some outliers, the responses were positive towards the statement. However,

FRSs 3 and 5 have a much wider distribution with greater numbers of their staff demonstrating a negative attitude towards the statement. A Kruskal-Wallis test to compare the scores of the five FRSs indicated that there was a significant difference between them (X^2=32.367, df=4, Asymp.Sig.=0.001). A series of Mann-Whitney tests, to identify between which FRSs those differences occurred, identified that FRS 1 was significantly different to FRSs 3 and 5; FRS 2 was significantly different to FRSs 3, 4, and 5; FRS 3 was significantly different to FRSs 4 and 5. FRS 2 had the largest mean rank score (467.96) suggesting they had the more positive attitude towards the statement and FRS 3 (332.72) had the lowest score with 26.8% of its respondents having a negative attitude towards the statement.

Question 34 was also a cross-cutting theme in that there were no statistically significant differences between the three role groups, nor were there any between the five FRSs. This question asked the respondents their attitude as to whether the level of training was not sufficient to make up for the loss of experience from attending fewer incidents. Other than some outliers the majority of the respondents had a positive attitude towards the statement, although a number in each role group expressed no opinion. Of the WB group 81.3% showed a positive response with 31% of this group strongly agreeing with the statement, the highest ranking on the 7-Likert scale. A small number of WB respondents felt so strongly on this issue that comments had been hand-written on the questionnaire stating they would have liked to have given a higher score for this question than the Likert scale allowed. The SO group was slightly more positive with thirty-eight of the forty-two showing a positive attitude with the remainder giving no opinion. Seven of the PO group showed a positive attitude towards the statement and six offered no opinion. An analysis of variance indicated that there was a significant difference between the groups: F(2, 810)=7.630, p=0.001. Post-hoc comparisons using the Tukey HSD test indicated that the PO group (M=4.62, SD=0.650) formed the first subset; the second subset consisted of the WB group (M=5.66, SD=1.010) and the SO group (M=5.83, SD=0.986).

Using the five FRSs as the independent variable the respondents in each FRS showed a positive attitude towards the statement with each having a mean score greater than 5.6 on the 7-Likert scale. An analysis of variance indicated there were no significant differences between the FRSs and that they formed a single subset. The result of the ANOVA test was: F(4, 18)=0.393, p=0.814. These results clearly indicated this was a cross-cutting theme across the five FRS but there was a clear difference between the three role groups.

Question 24 addressed the issue of how time that had previously been used for training was now being used to undertake community safety initiatives. The median score for WB staff indicated that they agreed with the statement with 76.5% supporting the statement with 14.4% having a negative attitude towards it. For the SO group the split was more even with twenty-two being supportive and eighteen having a negative attitude. POs were also split in their attitude with four in agreement with the statement; four had no opinion; and five in disagreement. An analysis of variance test indicated that there was a significant difference between the role groups: F(3, 810)=19.912, p=0.001. Post-hoc comparisons using Tukey's HSD test indicated that the WB group (M=5.37, SD=1.568) was significantly different from both the SO group (m=4.00, SD=2.072) and the PO group (M=3.85, SD=1.463). There was no significant difference between the PO and SO groups.

Amongst the five FRSs the results indicated they were in support of the statement. The only significant difference identified was between FRS 3 and each of the remaining four FRSs, with X^2=39.410, df=4, Asymp.Sig.=0.001. The mean rank scores showed that FRS 3 had the highest score (512.95), the next highest was FRS 1 (425.65), and the lowest score was FRS 4 (372.75).

This difference in attitude is not a surprising result as it was the operational staff at stations that were the resource used for implementing the CFS initiatives. The time required to implement these new activities had to be found from within their work schedule and the impact was on the continuation and maintenance training of firefighters. What was surprising was that many of the PO respondents do not seem to have appreciated the scale of the impact of community fire safety initiatives had on station personnel and their levels of competence. The outputs being measured across FRSs was the number of premises visited and the number of smoke alarms fitted. WB officers were unaware of any active monitoring taking place regarding the impact on training other than the numbers of individual personnel still being shown as competent on the IPDS system.

These CFS initiatives have been very successful with Knight (2013) reporting that independent evaluation of the Home Fire Risk Check scheme has contributed to a 57% fall in accidental fire deaths in dwellings and a saving of between £926m and £1,943m for the investment of £25m. However, this was during a period that the UK FRS has experienced an unprecedented rise in the number of firefighter fatalities in recent decades. A period during

which the FRS was losing considerable numbers of experienced firefighters and officers as they retired or left the operational side of the FRS, a loss that one might argue was not successfully managed by the FRA members and their executive officers bearing in mind the constraints of austerity they have had to operate under.

Question 15 consisted of a statement asking for the respondent's attitude to whether the promotion system produces managers, not leaders. Of the WB group 82.6% of respondents supported the statement whilst 7.3% had a negative attitude towards the statement. The SO group exhibited a wider distribution of responses resulting in twenty-two of forty-two respondents having a positive attitude towards the statement and eleven a negative attitude. The PO group had ten of thirteen respondents with a positive attitude towards the statement and three with a negative response. An analysis of variance test indicated that there was a significant difference between the groups: $F(2, 806)=19.606$, $p=0.001$. Post-hoc comparisons using the Tukey HSD test indicated that there were two subsets with the SO group ($M=4.48$, $SD=1.642$) and the PO group ($M=4.77$, $SD=1.691$) in the first subset; the second subset consisted of the WB group ($M=5.72$, $SD=1.332$). From the results it was evident that all three groups were in general agreement with the statement that the promotion system is producing managers and not leaders but the strength of the attitude of the WB group differentiated them from the SO and PO groups.

6.1.3 What are the artefacts of the safety culture in the FRS?

The FRS has a formal structure based on seven different roles from Firefighter to Brigade Manager each with their different responsibilities and levels of accountability. On a station it is not uncommon for those in different roles to refer to each other by their first names, which is thought to be more inclusive and in providing a positive contribution to equality and diversity initiatives. Some Watches differentiate between station based activities and those on the incident ground as to how they will address their WM. In those circumstances then whilst on the station it tends to be by the supervisory officer's first name. However, on the incident ground a number of Watches, often led by WMs who were firefighters in the 70s and 80s, or had inherited a Watch with this culture, will adopt the term 'Boss', 'Gaffer' or 'Governor' (more often abbreviated to 'Guv') depending on the national region the FRS is located in. Those that use the term on the incident ground do so because they believe it reinforces the authority of the WM and infers to all present that the WM's decisions are

orders and not an invitation to start a discussion. This also applies to firefighters talking to a SO, the term is still 'Boss'. The exception tends to be the Chief Fire Officer who is more commonly referred to by the abbreviated title 'Chief', or the Deputy Chief Officer as the 'Dep'. The FRS is well known for its use of jargon and particularly acronyms, some of which have been referred to in the body of the text in this research. Its use has caused issues in the past, particularly in interagency working where other services and organisations have not always understood what FRS staff are referring to. This was a criticism raised during the coroner's enquiry following the 7/7 bombings in London by the Rt.Hon. Lady Justice Hallet (2011).

The FRS still has associations with its historically based semi, or quasi-military culture which can be most readily seen at the change of watch when the oncoming Watch parades and individuals are detailed as to what appliances they will be riding and any changes to the programme of work for that shift. Technically, the off-going Watch should also parade but generally this tends to be less common, although two of the stations the researcher was observing both the on-coming and the off-going Watches did parade together.

Storytelling, particularly in the form of portal experiences, no longer seems to play a part in the life of the Watches that the researcher observed or visited. The longer-serving firefighters, coming to the end of their careers, attributed this to the lack of jobs (incidents) that the FRS now attend and firefighters with a limited number of years of experience being left with the feeling that they have nothing to contribute in participating. Their view is that once the younger firefighters have been deemed competent under IPDS they do not feel the need to listen to these stories as they believe they have nothing to learn. On the first day in attendance to ride with one of the busiest stations in one FRS the researcher met with the firefighters, as they congregated in the station office, before going on parade and prior to them taking over the station and the appliances from the off-going Watch. The younger firefighters informed the researcher that he had missed a good job (a fire) that had occurred on their previous shift and they proceeded to talk, with much excitement, about a fire in a ground floor kitchen producing lots of smoke and requiring the use of breathing apparatus (BA) for the first crew to enter. This incident was perceived by them as being a significant event as it was a fire, albeit with very little fire damage and being confined to the room of origin, in which there was a lot of smoke, and required the use of BA. That such a

relatively small fire was the subject of such interest is a reflection of the impact, and the success, of CFS initiatives which has resulted in fewer, and smaller, fires.

What was noticed by the researcher around the stations visited were different artefacts, ranging from pictures from previous incidents that the station had attended, that had occurred on the station's ground, or relating to notable individuals associated with the station. At a number of stations, Chief Fire Officer commendations, normally awarded for rescues on the incident ground, had been framed and were often found to be located in the station's reception area where they can be readily seen by visitors to the station. In a similar fashion, if a member of the station had died whilst on duty there would often be found some pictorial reminder of the individual and the event. These could range from brass plaques associated with firefighter fatalities in the distant past to framed pictures with some form of annotation informing the viewer of the incident and the individuals involved.

Whilst conducting the analysis of the data it became apparent that there were some patterns arising from the data in relation to the different FRSs that participated in this research. The most obvious difference between the FRSs related to FRS 3 and that the response of its staff was often significantly different to that of the other FRSs, which the researcher attributes to the historical context associated with this FRSs. FRS 3 is one of a small number of English FRSs that have a reputation as having an antagonistic relationship between the WB staff, represented by the FBU, and FRS management. Their response to the statements in the safety culture questionnaire indicates a willingness to take a negative view of their management and its actions when answering the majority of the questions in comparison to the other participating FRSs. This contrasted with FRS 2 who demonstrated the opposite attitude and appeared much more supportive of their FRS management. Across a number of questions there appeared to be some similarity between how FRS 1 and FRS 2 responded to the questions. These are two entirely dissimilar FRSs in that one is heavily dependent on On-Call staff to ride their fire appliances across what is considered to be more of a rural FRS; whilst FRS 2 has a greater number of suburban and city areas with greater numbers of residents and areas of light and heavy industry. However, the common factor between these two FRSs is their regional location, which reflects that part of England that has not had the benefits of the financial resources normally associated, rightly or wrongly, with those local authority areas in the south-east of England. Respondents from

FRSs 4 and 5 gave similar responses to many of the questions, which was of no surprise to the researcher, and which he attributes to the similarities, not only of the two FRSs, but in the nature of the risks and the geographical area that they both cover.

With regard to the three role groups the WB group is the most numerous with smaller numbers of SOs and POs so they have a stronger influence on the overall responses of the individual FRSs. The results of the analysis clearly showed that even when the WB and the PO groups might share a positive or a negative attitude towards a statement there would often still be a statistically significant difference between their responses. The SO group occupied the ground between them and could equally be found to either have no significant difference with the PO group, or in answering another question, with the WB group. Alternatively, they might form a third subset of their own. At other times, and particularly when responding to those questions to do with operational matters, their tendency was to respond in a similar fashion to the WB group based on their own operational experiences.

6.1.4 What are the influences affecting the perceptions of key stakeholders of operational risk to FRS operational personnel?

Traditionally, the FRS has attracted to its workforce what Lyng (2008) refers to as edgeworkers. These are the individuals that are typically attracted to high-risk occupations or extreme sports. Many ex-servicemen, and those favouring extreme sports such as free-fall parachuting and rock climbing, have joined the FRS for this reason. Of the three Watches the researcher was located with, there were only two individuals that the researcher would have categorised as being potential edgeworkers. These are the individuals that want to be the first person on a jet into the burning building. Talking to a number of SOs and experienced firefighters they agreed that this type of person was now a rarity in the FRS with most attributing this to the reduced number of calls, smaller sized fires, and hence the level of excitement to be derived. Some suspected the reduction in ex-service personnel entering the FRS may be the result of equality and diversity initiatives in attempting to change the overall culture of the FRS. The FRS has been negatively influenced by certain events that have left the FRS being accused of being risk averse. This has particularly been highlighted in the different news media outlets. The public still expects the FRS to come to their rescue if called but the legal and regulatory framework,

particularly HSE legislation and how it has been enforced, has led individual FRS officers to become more defensive, and risk averse, in their mode of operations. This has often caused WB staff to become frustrated and even angry at these officers who they perceive to be preventing them from doing their job.

6.2 Management

At the time of the introduction of the Fire Services Act 1947 the FRS in England was under the auspices of the Home Office until 2001 when control was passed to another government department, the Office of the Deputy Prime Minister (ODPM). In 2006 with the dismemberment of the ODPM the FRS became the responsibility of the Department of Communities and Local Government (CLG). At the time of writing this thesis the indications are that the FRS will once again come under the control of the Home Office.

6.2.1 National management of the FRS

The independent review conducted by Bain et al. (2002) commissioned by the Labour government was the basis for the White Paper 'Our Fire and Rescue Service' which outlined the central government's new initiative and its proposals for new fire legislation. These two documents were the basis for the National Framework document that highlighted the component parts that would form the structure of the FRS modernisation programme. The draft of the National Framework (2003) document identified nine key areas of which the following were included:

- Risk Management and Prevention: mapping the community risk profile, preventing fires and managing community risk.
- Fire and Rescue Staff: fair and effective management of FRS staff including what was described as 'important issues of equality and diversity'.
- Workforce Development: the introduction nationally of the Integrated Personal Development System and the provision of training.
- Effective Performance Management of FRSs: Best Value and progress towards the introduction of the Comprehensive Performance Assessment process.

Risk management and prevention has seen the change of emphasis in the English FRS from one of extinguishing fires and carrying out rescues (reactive) to focussing on the prevention of fires (proactive). New money to the sum of £25m was made available by the Office of the Deputy Prime Minister (ODPM), who used to oversee the FRS before the duty was passed to the CLG, to fund a new programme in England to be run locally by FRSs. This was to provide smoke alarms to residential premises with the priority being focussed on those areas in which there were more likely to be a higher number of fires and in which fire deaths had previously occurred. There were no new personnel resources made available for this programme and the work of advising and educating members of the public as well as installing the smoke alarms became the responsibility of local firefighters, predominantly WT firefighters. This work was carried out using the time that would have previously been utilised to conduct drills, training and simulations by WB staff. SOs found their time occupied with administrative duties associated with implementing the outputs from the FRS modernisation programme on top of their normal administrative tasks such as completing returns to FRS HQs, station planning activities, and inter-agency planning and their associated meetings.

Sir Ken Knight (2013), the first Chief Fire Rescue Adviser (CFRA) concluded that FRAs still needed to change to reflect the different risk profiles and the decreasing demand being made on its services within their geographical areas. Fire deaths were at their lowest recorded number, a reduction of 40% in the last decade alone, attendances to fires were down by 48% and building fires down by 39%. Knight asks why, with this decrease in demand, there has not been a similar decrease in costs and in particular the number of resources committed to the FRSs? Furthermore, he identified local politics as being an issue constraining the modernisation of the FRS including improved FRS service delivery models particularly in regard to the location of fire stations and the number of appliances. The FRAs and the FBU have a different outlook on this and refer to localism and equity of service provision not being based on a postcode lottery of FRS delivery; whereas Knight refers to siloism and to supply and demand. Knight identified that, across the 46 FRS authorities he oversaw, each FRA had different governance structures, leaders, and their own organisational eccentricities which he contends does not lend itself to providing a sensible delivery model. One solution he suggested to overcome this is for FRAs to merge but he comes back to the issue of local politics when he identifies the lack of appetite on behalf of the FRAs to follow this course and there being no incentive to do so.

6.2.2 Local Management of the FRS

The two key elements involved in the management and the running of a FRS in England are the elected members of the FRA who act as a Board, and the FRS management team consisting of its executive directors who are POs in most FRSs. However, the FBU, the largest of the representative bodies, exerts a substantial influence on the management of a FRS usually through its political connections with the local authority, specifically to the Labour party to whom the Fire Brigades Union (FBU) is affiliated (PO interviewee). Bain et al. (2002) recognised that the relationship between the CFO and the FRA was of critical importance and it is evident that the influence of the FBU can affect that balance.

Bain et al. (2002) identified in their report that the quality of leadership and the contribution made by the locally elected politicians on the FRA was poor. They recommended that not only the quality of the members but their commitment should be developed by the Local Government Association (LGA). This was an issue that had previously arisen during the Best Value process where HMFSI had commented on the lack of robust 'challenge' by FRA members as part of the Best Value process. Many FRSs now run an induction course for newly elected members of the FRA but FRS officers continue to comment on the variable, or poor, contribution made by the majority of FRA members.

The selection of a CFO or PO is made by the FRA and can be dependent on whether a Chair of a FRA believes a certain candidate might affect the way in which the Chair exercises control over the FRS. Some officers in their interviews with the researcher used the term "fiefdom" or a similar term, referring to how some CFOs and Chairs enacted their role in the FRS. The protectionism and perception of a fiefdom might also be a contributory factor to Bain et al's (2002) comments regarding the potential for reform in the FRS and how it had fallen behind best practice in both the public and private sectors. However, Rochlin (1987, in Perrow, 1999) warns us of the risk associated with High Reliability Organisations (HROs), which the FRS would like to see itself as, in trying to emulate other organisations and the sought after "combinations of stability, routinization, and lack of challenge and variety that predispose an organization to relax vigilance and sink into a dangerous complacency that can lead to carelessness and error."

6.2.3 Assurance and audit

External inspection, also referred to as audit or scrutiny, was the remit of the HMFSI but following the recommendations of Bain et al. (2002) report it was disbanded and its function was passed to the Audit Commission (AC). Knight (2013) summarised the current regime, following the demise of the HMFSI and subsequently that of the AC, as being a peer review which was jointly developed and is staffed by the LGA and CFOA. Knight confirms that this is seen as a tool for service improvement and the process is a voluntary one being held every three years although an FRA can request additional peer reviews. For the peer review the FRA identifies for itself which areas it wants to be reviewed and can also choose who they want to form that review team. This forms the basis of the difference between independent audit, and internal or peer review. As Knight points out, this is not scrutiny and he raises questions regarding whether FRAs should be allowed to select the review team. The researcher would also question whether such reviews should continue to be limited to reviewing only those areas that the FRA wants reviewed and not to include areas that have been cause for concern in other FRAs; but who collects and collates this information now with the demise of the HMFSI? The simple answer is no one. This does raise concerns to the researcher as to who is now providing the scrutiny and assurance to ministers and the public as to the effectiveness and efficiency of the FRSs? Other public bodies still retain their own inspectorates to provide this assurance and scrutiny for the central government.

At this time it would appear that a situation has arisen regarding independence and objectivity of the review teams. Both the current and previous incumbent of the position of CFRA were previous presidents of Chief Fire Officers Association (CFOA); CFOA members are the executives responsible for the management of the individual FRSs on behalf of the FRA; it is the CFOA members and the FRA that determine what they want reviewed and what is not to be reviewed; they then select the team members who will conduct that review and it is CFOA and FRA members who provide the body of the review team. The structure and process of the peer review raises questions regarding its objectivity and independence particularly as it would appear that there is the possibility that having been reviewed, officers or members of that reviewed FRA might then be selected to conduct a review of the FRA that had previously reviewed them. Knight acknowledges this when he says that for the purpose of ensuring “the process to be meaningful and inspire confidence,

services (*FRSs*) should not be able to continue to choose the review team and review reports should be published together with an action plan as a matter of course" (Knight, 2013, p65). The researcher suggests that the CFRA might consider recommending new arrangements that would ensure the objectivity and independence of the review teams. This would certainly address questions regarding independence and contribute to openness and transparency as well as ensuring accountability of the FRS executives and FRA members. It is worth noting that the Scottish Government has now done away with the CFRA role and CFRAU(Scotland), and has instead reformed the HMFSI(Scotland). The English CFRAU changed its name in 2013 to the Fire and Rescue Advisors Team (FRAT) and was reduced in size. It still remains the advisory team to civil servants and Ministers and is part of the Fire and Resilience Directorate (FRD). Since January 2016 the FRD is part of the Crime, Policing and Fire Group within the Home Office.

Green (2008) referred to a substantive body of research into audit being conducted by auditors that focus on a specific industry taking into account their training and knowledge of that industry and their experience in auditing that industry. These factors have been identified as providing auditors with the depth of understanding to identify misstatements and improving the value of their judgements. Green's research into the use of analytical procedures in audits by specialist industry auditors indicated that there was evidence to support the proposition that specialists are more "focussed and efficient" in finding the relevant information and that there was an "incremental increase in efficiency and effectiveness gains achieved by industry specialist auditors over non-auditors who have some industry experience" (Green, 2008, p243-244). This need for knowledge and familiarisation of the industry being inspected was acknowledged by the HSE in their second guidance note 'Striking the Balance' in which it refers to HSE inspectors receiving specific training to provide them with the understanding of the work of the FRS to better enable them to conduct their audits and inspections. The researcher spoke to two POs that had been involved in providing familiarisation training to a group of HSE inspectors with the use of fire simulation software. The scenario involved a modern office building consisting of a number of floors. Crews had entered the building and were searching for the seat of the fire. The scenario then showed smoke escaping from windows of an upper floor and their reaction was to immediately evacuate the building and to fight the fire defensively from the exterior of the building. The FRS instructors had to explain in detail the work of the FRS and that in reality the risk was acceptable to professional firefighters. This highlighted the lack

of understanding of the work of the FRS between HSE inspectors and professional firefighters. It is worth noting that the budget for the HSC has now been reduced on two separate occasions and there appears to be a move to the HSE becoming more reactive rather than proactive in its inspections. In these circumstances, combined with the lack of a robust scrutiny regime such as that of the HMFSI, it is likely to mean FRSs may develop the latent conditions, or be in the incubation period leading to an accident, that the FRS and its FRA are currently unaware of.

Following the example of the London Fire Brigade (LFB) some FRSs have previously introduced their own internal operational audit function that has focussed on operational activities and those functions supporting it. This assurance function can be used to operate in tandem with the FRS's health and safety section with the former taking on a proactive role and the latter a reactive role regarding firefighter safety. However, the work of these assurance teams tends to be subject to the influences of POs and SOs with their own agendas as has been brought to the researcher's attention at previous fire related conferences in discussions with SOs undertaking this role in their own FRS. One SO interviewee informed the researcher that an operational assurance officer in his FRS had had to transfer to another FRS as the audit he had led did not meet the outcomes a PO wanted recorded.

The model for the activity of an FRS assurance function has been that of the HSE document HSG65 which incorporated the elements of Policy, Organising, Planning and Implementing, Measuring performance, Reviewing performance, and Auditing. Most FRSs have never been able to differentiate between review and audit but the Institute of Internal Auditors (IIA) (2011) provides some assistance when it states that "the internal audit activity must be independent and internal auditors must be objective in performing their work." It provides additional guidance to what it means by the terms independent and objectivity in the following terms:

> "Independence is the freedom from conditions that threaten the ability of the internal audit activity to carry out internal audit responsibilities in an unbiased manner. To achieve the degree of independence necessary to effectively carry out the responsibilities of the internal audit activity, the chief audit executive has direct and unrestricted access to senior management and the board. This can be achieved through a dual-reporting relationship. Threats to independence must be managed at the individual auditor, engagement, functional and organisational levels."

> "Objectivity is an unbiased mental attitude that allows internal auditors to perform engagements in such a manner that they believe in their work product and that no quality compromises are made. Objectivity requires that internal auditors do not subordinate their judgement on audit matters to others. Threats to objectivity must be managed at the individual auditor, engagement, functional and organisational levels."

The IIA also provides advice regarding conducting an audit into a function or process in which the auditor may have previously been employed or had responsibility for which may prove useful to FRSs to differentiate between a review and an audit (assurance). The IIA recommends a period of three years from having moved to another function or having handed over those responsibilities so as not compromise perceptions of objectivity and independence.

This guidance raises some questions regarding objectivity and independence for those FRSs that did, and those that still maintain an assurance/audit function of their own. The most recent edition of the HSG65 document (Health and Safety Executive, 2013) still refers to measuring and reviewing performance but it has omitted the audit process. However, it does highlight that those persons undertaking the review function should "have the necessary training, experience and good judgement to achieve competence in this task" (Health and Safety Executive, 2013, p56). There is no indication as to why the audit process has been omitted but this may be because the HSE sees audit as being carried out by an external organisation, i.e. themselves, and that reviews are carried out by internal staff. If this is the case then it flies in the face of the concept and standard practice of internal audit in relation to external audits. It might also be a response to a process of consultation in which organisations have expressed concerns regarding the costs associated with maintaining an internal, or independent, audit function specifically for the purpose of meeting the HSE's expectations in achieving successful health and safety management. By using the term review instead of audit/assurance there is the potential risk that the independence and objectivity of 'reviews' will come under even greater pressure and the influences of different sources of internal power within a FRS.

Two POs from different FRSs stated to the researcher the benefits of having an internal assurance team from their own experiences. In the opinion of one PO the role of the assurance team had been crucial in turning around an ongoing situation in which he and his fellow directors had concerns regarding the ability of their FRS to operate safely on the incident ground. A SO in that same FRS also spoke of the positive impact the establishment

of an assurance team had on the performance of FRS personnel on the incident ground. A WM in that FRS had told the researcher that, following the debrief conducted by the assurance team of a large incident at which he had been the first incident commander, he had learned more in that single debrief than he had in the previous 18 months since he had been promoted. That particular assurance team had adopted a variable approach in that when necessary they mentored those that lacked the experience to deal with a situation, and provided a sounding board for the more experienced officers who found themselves facing an unusual situation perhaps outside of their range of experience. Other FRS assurance teams have been more focussed on attributing 'blame' and have not been so well received in their own FRSs. The second PO had previously served in a FRS that had an assurance team that was staffed with experienced officers. However, in his current FRS, which attended a smaller number of incidents it was difficult to identify the experienced officers that could fulfil this function. Then there were the costs associated with such a team which he believed could not be justified during a time of austerity cuts within his FRS. The researcher would argue that if these experienced officers were used in a 'variable' role then they could act as mentors passing on their experience to other officers to learn from. In time they could then become more objective and independent of the incident command team as the experience base amongst other officers increased. A small number of FRSs with assurance teams have increased their 'added value' by utilising these teams to act as senior accident investigators for serious near misses or accidents.

SOs in different FRSs have informed the researcher that most internal assurance functions have now been downgraded, if not entirely done away with, as one of the first responses to the austerity cuts imposed by central governments on local authority grants. This raises a question that in reducing the effectiveness of a safety system or eliminating it all together, in favour of a 'production' system (in reference to Reason's (1997) categorisation of systems, what other measures or controls have been put in place to provide the same level of safety for operational firefighters? This was an issue raised by the Columbia Accident Investigation Board (2003) which found that in the attempt to reduce cost and under pressure to reduce its overall budget the workforce had been significantly reduced. This was particularly so in those areas in which experience and knowledge had provided the capacity to protect the organisation; that is the safety assurance teams. Most FRSs operate now using Monitoring Officers (MO) to report on FRS performance at incidents that the MO attends. The MO is a function they can be allocated to any SO, with an operational

commitment, as long as the MO's role (rank) is greater than that of the IC they would be monitoring. However, there is an issue with this monitoring function regarding the objectivity of this officer. If that officer is managerially or directly responsible for the crews involved at the incident and there prove to be gaps in their capability and competence then there may be an inclination to be economical with the truth, or even not to report such occurrences at all. A second issue might arise if it was thought, in hindsight, that this MO should have taken charge at the incident as the incident commander was struggling or for some other reason. This would reflect on the MO's own performance, which he might be reluctant to report on. The MO is part of the temporary command system established for a particular incident and this SO would be seen as being both responsible for that temporary command system and subsequently reporting on its performance; there is a potential conflict of interest.

Respondents were asked whether learning opportunities are affected by individuals seeking to deflect blame on actions they were responsible for. There was a statistically significant difference between the attitude scores of the WB group when compared to the SO and PO groups. The effect size was quite small (r=0.010) despite having reached a statistically significant difference. Of the WB staff 57.3 %, 24 of the 42 SO group, and 3 of 13 POs had a positive attitude towards the statement that learning opportunities are being affected by individuals seeking to deflect blame. This might be thought to be an indicator that the WB and SO groups still believe a blame culture might be operating in their FRSs despite what the PO group might believe.

Scrutiny of the FRS has effectively been removed and replaced by what might be at best described as a process of self-review, both in the overall management of the FRS and at individual operational incidents. Operational debriefs may counter this but they take a long time to organise and there is often a reluctance to speak freely in the presence of others who they might be criticising. Some officers have also suggested a level of collusion between individuals or crews prior to these debriefs. The researcher would question as to who judges the outcomes of the FRS following an incident as to whether they were effective and efficient? Knight (2013), the CFRA at that time, acknowledges that the members of the public don't have the knowledge by which to judge the performance of the FRS. The researcher was twice in the company of SOs from different FRSs during the period in which there was considerable national media interest and reporting of a large fire in

which the FRS involved was being praised by all. Independently of each other, both SOs raised questions on just how well the FRS had performed based on the visual cues in the still pictures and on video broadcast by the media. They did qualify their remarks in that they had not been in attendance so were not privy to all the information.

6.2.4 Leadership and management

People interpret what leadership means in different ways and WB staff initially had some difficulty in defining what they thought was meant by leadership, particularly in contrast to management. However, on asking them to look back at occasions and events of what they thought when good leadership had been demonstrated it was always on the incident ground and it was by one or more individuals they respected and who had been a role model for them in some stage of their career. A common denominator for these role models in being viewed as leaders was that they were deemed to be experienced in their role on the incident ground. In comparison to a leader they defined a good manager as being proficient at using the organisational and administrative systems of the FRS. Here we can see leaders being associated with the 'hot' side of a FRS and managers with the 'cold' side of the organisation.

During the course of this research the researcher became familiar with the three WMs of the Watches he was situated with. Two had been in their respective FRSs for over 20 years each and had been WMs for some considerable time. The third WM was relatively new in the role and had been posted to that Watch and station, according to members of his Watch, as an opportunity to gain operational experience. The two more experienced WMs were referred to with pride for their operational reputation by their own WB staff, and with respect by some of the SOs the researcher spoke to. The culture of the two Watches matched the attitude of their respective WMs. This contrasted with the third WM who led the Watch not so much through respect based on a sound operational background but for the role, or rank, the individual held. This may be because this WM had not been in charge of the Watch for the extensive period that the other two WMs had. It may well also have been that the junior officers and firefighters on this Watch were always quick to talk about the acquired experience base of the Watch but the WM did not seem to be included in the use of the term 'Watch' or when talking about experience, but would be referred to separately pointing out he had come from the training centre, which is a non-operational

role. As one CM that knew the Watch well explained to the researcher the WM was only there to get a 'tick in the box' in regard to meeting the operational criteria for his next promotion. When talking about leadership they would all refer to their previous WM as an example but not their current WM. It was this belief that he would not be there long, compounded by the WM electing to shut himself away in the WM's office for long periods of time, that might have contributed to this apparent lack of a strong relationship yet to develop between the WM and the Watch. This swapping in and out of personnel to allow them to gain experience was previously suggested by Holroyd (1970), but the researcher was reminded by one SO of the quote originally attributed to Gaius Petronius Arbiter[15], a Roman satirist and which might just as easily be applied to the effects of the FRS modernisation programme:

> "We trained hard, but it seemed that every time we were beginning to form up into teams, we would be reorganized. I was to learn later in life that we tend to meet any new situation by reorganizing; and a wonderful method it can be for creating the illusion of progress while producing confusion, inefficiency, and demoralization."

Of the three WMs only one ensured that their Watch was undertaking regular station drills, either on the station or off-station, and the researcher was generally impressed with the level of competence demonstrated by the firefighters and crew managers of that particular Watch when compared to the other two Watches observed. The researcher observed two firefighters, both trained as instructors by their FRS, that in the drills or exercises they supervised their focus was on compliance with SOPs. When questioned later by the researcher they were unwilling to accept that there was scope for SOPs to be amended to meet the circumstances of an operational incident; that mind-set reflected what they had been taught during their respective instructor courses. A difference between the three WMs that the researcher also identified was that the two more experienced WMs were focussed on meeting the needs of their Watch whereas the third WM was more focussed on his/her profile, i.e. their own needs as opposed to task or team needs as outlined by Adair (1988). Gabriel (1985) emphasises three obligations of an officer: technical competence, to be a role model, and to provide sound judgement in their decision making. Without these he believes effective units, or teams, cannot be established and that these three obligations affect the future development of operational decision makers. These three obligations would also resonate with many of the WB staff the researcher spoke to.

[15] Others have attributed this quote to Charlton Ogburn Jr.

During the fieldwork the researcher witnessed at one station a firefighter giving the temporary WM[16] in charge a very difficult time and undermining the authority of this supervisory officer in front of the whole Watch. A visiting SO, who happened to be present, witnessed what the researcher believed could be considered behaviour that was consistent with bullying and harassment. The temporary WM was in a very awkward position and as Gabriel (1985) found in the US military and as is often the case in the FRS junior managers are expected to not rock the boat so it is very difficult for a junior manager in the FRS to take action as there is a lack of confidence in whether the FRS will support that officer and how it will reflect on his own reputation and future opportunities for promotion. In a private moment with the researcher this WM raised these exact concerns and thought it was just something he had to put up with. On this particular occasion the SO present departed witnessed this occurrence but having failed to support the WM just reinforced the WM's views of the lack of support that can be expected from SOs. There is an alternative perspective on how this can be viewed in that if the firefighters had no trust or confidence in their WM then they will look for leadership from within their own ranks. This was a contributing factor leading to the death of a firefighter in the 1990s.

The new Foundation and Incident Command (Chief Fire Officers Association, 2015b) document now refers to operational roles as being commanders rather than managers. This may reflect the concerns of some CFOs that incident commanders are not commanding at incidents and that they are now looking to remedy this by changing the role title to include 'commander' instead of manager to emphasise this point. The adoption of the title of Manager was originally a response to equality and diversity initiatives so as to make the non-uniformed staff feel more included and equally valued. At the time of writing this thesis the indications are the new Commissioner (Chief Fire Officer) of the London Fire Brigade wishes to reintroduce the use of ranks to replace the current roles.

6.2.5 Risk and rewards

During the interviews and focus groups with WB staff there would be a discussion at some stage about the equitable distribution of risk and rewards between WB staff when compared to that of the POs. As firefighters would be quick to point out, all firefighter

[16] The term 'temporary' refers to an individual taking on the role of the next level of officer for a temporary period of time. The officer may be from the same watch or seconded in from either another Watch or from another station altogether.

deaths involved WB staff and not the POs or SOs. The conversation would then invariably move on to the fatal incident at Atherstone on Stour where the four firefighters died and three officers, two being WB junior officers, were charged with negligent manslaughter. Firefighters still cannot understand why no PO was charged for their role as a director responsible for systemic failures that had occurred in their area of responsibility. The firefighters see themselves as bearing both the physical and the worst of the legal risk yet there seems to be no recompense financially for carrying this risk when compared to POs. The researcher was reminded by WB staff that many POs receive handsome salaries and additional bonuses yet seem to be immune to either the physical, legal or financial risks. The financial rewards for POs and particularly the ability for them to retire and reap the rewards of their pension and then almost immediately step back into the same job once again has even come to the attention of the Daily Telegraph (Malnick and Jamieson, 2016) in which they quote a Home Office spokesperson who described the payments being made as unacceptable. The article also referred to one FRS in which three POs received substantial bonuses for their work outside of their contractual arrangements during industrial action taken by their operational staff. As another interviewee asked, why is it that as the level of responsibility, measured in size of budget, number of personnel, and resources, has reduced due to the austerity cuts the POs introduced, yet their basic pay and bonuses have substantially increased? This is while the pay of the firefighters, who bear the additional risks those cuts have exposed them to, has hardly changed over that same period of time.

Being re-employed is an option open to other staff but this brings into question the ability to continue to carry out a physically demanding role later in life. As one firefighter stated, having to work until you are sixty-five years of age as an operational firefighter before you can receive your pension will make you more risk averse just so you can pick up your full pension.

The difference in risk and reward between POs and other operational staff can be associated with what Perrow (1999) describes as a ‘class bias’ that may be either deliberate or unintentional. In the past most accidents have been attributed to operator error. He refers to this as being too simplified an approach in much the same way Dekker (2012) might refer to a blame culture being present rather than that of a just culture. Perrow recognises the need in certain circumstances for operators who have to ignore safety

precautions to get their job done but it is they that are then blamed if they are injured or killed. Yet in most cases the operators receive no fair reward such as higher wages for the risks they take. He acknowledges that there is no equitable distribution of the consequences and asks why? He believes that for many executives the latency period before an event occurs is likely to see them retired before that event actually happens. Perrow tells us that very few managers are punished for not prioritising worker safety, which may be argued, was a contributory factor at the fatal fire in Atherstone on Stour. Perrow believes that managers, after time, start to believe the organisational message regarding safety being a priority because managers further down the organisational hierarchy are withholding the data or suppressing the reports, for their own reasons, that would suggest otherwise. The researcher would add to this that although the data may have been captured the analysis and the reporting systems are insufficiently mature in many FRSs to allow them to identify safety trends. This makes it awkward for POs to defend their position in the event of a major catastrophe such as a firefighter fatality as the data is likely to be there but the FRS decided, often on an analysis of costs based on short-term benefits, to utilise administrative staff. Generally, administrative staff are cheaper to employ when compared to the additional costs associated with an analyst with the skills and expertise to analyse the data to inform decision making processes within the FRS. The researcher is aware of at least two examples of where the FRS assisted staff to obtain health and safety qualifications but once qualified they promptly left as the FRS will grade their skills at a level of pay that is much lower than the industry standard. In another English FRS the risk manager had to pass his information and reports via two layers of line management before it reached the level of the senior management board. So there were at least two line managers, and possibly a third at executive level that might have vested interests in amending or withholding those reports and the information they contained. This is not unknown even at the highest levels, with a PO interviewee informing the researcher that in his previous FRS an internal accident report relating to an incident in which there was a firefighter fatality was amended by POs before being presented as evidence to the coroner's court. This came to light when the officer who wrote the report stated when asked that it was not the original accident report that he had written. The final reason for inaction that Perrow offers for a lack of management concern or vigilance is that catastrophes are fairly rare so the probability of it occurring are relatively small

encouraging managers to consider taking the risk although the consequences may be significant to their staff and the organisation.

6.2.6 Trust and confidence

At one time SMs and even GMs, both of which form the SO group, in larger metropolitan FRSs were employed on the same rota, or shift pattern, as the WB staff on stations. In an effort to improve the management of stations, from the perspective of POs at that time, a decision was taken to relocate SMs so that there was one at each station and their rota system was completely changed to one that better suited their managerial function to the cost of their operational function. In some FRSs the SMs live many miles from their station and the likelihood is that they never see the station personnel they are responsible for performing at operational incidents. With fewer calls to incidents and relatively few exercises being conducted, the opportunities for familiarisation between SOs and WB staff have also decreased so they do not get to recognise each other's capabilities, their strengths and weaknesses. This prevents the two groups from developing traditional trust between them, such as that which can be found operating within a Watch, being based on their shared experiences, predictable behaviour, and on proven levels of competence. Instead they are reliant on what Seppänen (2013) calls 'swift trust' associated with temporarily constructed groupings, such as constructed by the FRS at an incident. This was a concern raised by WB staff in many of the researcher's visits to stations. Many said that they did not often see their own SM whilst they were on duty let alone at incidents. During the period of fieldwork the researcher very rarely saw the SMs on the station and their work always seemed to take them off elsewhere to different meetings or on FRS project work. Asking WB staff when their own SM last watched them drilling or was in attendance at one of their exercises the response was invariably that they couldn't recall a time other than if the SM had been detailed to attend, or was responsible for the organisation of the event. During the researcher's stay with two of the three participating Watches at no time did he witness the SMs of those stations watching drills or circulating around the station talking with firefighters. The third Watch did attend an exercise at an external venue and although there were two SMs in attendance both were from other stations. In this way there has been little that would suggest that the necessary interaction between SOs and WB staff has taken place providing an opportunity to develop this traditional trust. When asked, SOs informed the researcher that they had to assume WB staff were competent in

their role but on further questioning admitted that competence provided only a baseline and that they had no real idea of the 'professionalism', or what the crews were actually capable of. This lack of appreciation of the 'professionalism' of officers and teams makes it difficult to develop effective teams and it would be worth reminding ourselves of Gabriel (1985, p10) when he refers to the bonding, or the development of trust, between officers and their soldiers in battle when the soldiers see their officers as being "competent, trustworthy and dependable leaders". The key is that they want to see this level of competence demonstrated before they will give their trust and place their confidence in their officers. Confidence can be a fragile thing, and even more so in the case of self-confidence. A PO informed the researcher that following the court case, following an incident in which there was a FRS fatality, that all the SOs who had been incident commanders at this incident leading up to the fatality had now left the FRS. The inference being that they had lost their self-confidence and self-belief.

Question 29 within the safety culture questionnaire asked respondents about their attitude towards whether accident investigations are mainly used to identify who is to blame. The results indicated that there is a statistically significant difference in attitude scores of the three role groups ($F(2, 809)=39.938$, $p=0.001$) with the WB group ($M=4.61$, $SD=1.755$) having a significant difference to the both the SO group ($M=2.50$, $SD=1.656$) and the PO group ($M=2.23$, $SD=0.832$). There was no significant difference between the SO and the PO groups. Of the WB group, 69.4%, seven of the forty-two SOs, but no POs thought the outcomes of an accident investigation were focussed on apportioning blame, It would seem the WB staff are yet to be convinced their FRS no longer operates a blame culture and has some distance to travel before it can be seen to be operating a just culture. Using the Kruskal-Wallis test there were significant differences found between the five FRSs ($X^2=78.384$, df=4, Asymp.Sig.=0.001). Using a series of Mann-Whitney tests in was found that the only FRSs that there were no differences between were FRS 1 and 4; and FRS 2 and 4.

When asked whether operational procedures are just a way of covering managers' backs in Question 35, an analysis of variance test indicated there were significant differences between the role groups ($F(2, 806)=40.660$, $p=0.001$). The WB group ($M=3.91$, $SD-1.842$), and both the SO ($M=1.64$, $SD=0.850$) and the PO group ($M=1.69$, $SD=0.480$). There were no significant differences between the SO and PO groups. The results indicated that 42.4% of

WB staff, just one SO, but no POs showed a positive attitude towards the statement. The PO group showed quite a strong attitude against the statement with nine respondents disagreeing and four strongly disagreeing with the statement. From the overall results we can see that a considerable percentage of firefighters believe SOs are using procedures to cover their backs or to take a more defensive and risk averse approach in fighting fires. With only one SO sharing this view it shows a large difference in the attitudes between WB staff and the two groups of SOs and POs leading to a sense of frustration on the part of the WB staff particularly, as WB staff and SOs will come into regular contact with each other on the incident ground at larger incidents. This was the same response that came up in some of the firefighter interviews but was even more prevalent during the focus groups on stations.

A further question asked whether respondents find themselves often having to work on the incident ground with staff and SOs that they had rarely trained with. The results indicated that there were no statistically significant differences between the attitude scores between the WB, SO and PO groups ($F(2, 808)=1.172$, $p=0.310$). Of the respondents 64.1% of WB staff, twenty-eight of the forty-two SOs, and ten of the thirteen POs have a positive attitude towards the statement indicating that they often have to work with people they have rarely trained with. During the course of the researcher's interviews and focus groups the WB staff referred to the random nature by which SOs appear to attend incidents. The SOs and POs attribute this to the different shift patterns of the SO and WB staff, and the impact of the administrative nature of the job of the SOs which may require them to attend meetings at which they have to book themselves unavailable for emergency calls. Their administrative duties may also take them too far from their own station for them to attend should their station's appliances be mobilised to an incident.

FRS respondents were asked if crews of appliances often have to work without their supervisory officer because they have been tasked to carry out another role on the incident ground. Using an analysis of variance test it was found there were no significant differences between the three role groups ($F(2, 810)=10.929$, $p=0.001$). Of the respondents 64.3% of WB staff, fifteen of forty-two SOs, and four of thirteen POs agreed with this statement. Using an analysis of variance test between the five FRS it was also found that there no significant differences between them ($F4, 818)=1.649$, $p=0.160$). From these result we can determine that WB staff often find themselves having to work without their supervisory

officer; a view shared by SOs and POs although not held so strongly. This result was not a surprise to the researcher in that this was what he was being told by WB staff during his fieldwork but it appears both the SO and PO groups may not be so aware of the frequency with which this occurs on the incident ground. Although the number of incidents is decreasing, particularly the larger more complex incidents at which greater levels of control are required, they still require certain operational roles to be filled such as safety officers, water officers, sector commanders, Stage II Breathing Control Entry Control Officers etc. These roles in practice are normally undertaken by WB officers being separated from their appliance crews they were responsible for. Following the Gillender Street fire in London 1992 the LFB was criticised in that crews entering and operating in high-risk smoke-laden areas wearing breathing apparatus were not being led by officers, that is their own WB officers. The responses to this question would support the contention that this is still happening at incidents.

6.3 Procedures

The standard operating procedures (SOPs) are the safe working practices for each FRS. They are based on guidance that used to be provided by HMFSI on behalf of central government. It was explained to the researcher that, following the modernisation of the FRS and the disbandment of HMFSI the maintenance and production of new guidance became an issue for the FRS. The situation was resolved with the CFOA becoming responsible for producing the guidance documentation on payment by central government. However, at about the time of the height of the period of firefighter fatalities, central government wanted to stop making the payment yet expected the CFOA to continue the work. This may be a factor as to why for a long period of time there was a lack of guidance being provided to FRSs. The FBU's report 'In the Line of Duty' (2008b) on firefighter deaths commented on this lack of guidance from the CLG and stated that the publication of circulars with their lack of detail did not provide the guidance that was missing regarding firefighter safety. The FBU (Dark, 2011a) identified that this lack of guidance was the cause of a "policy vacuum" reflected in the number of firefighter fatalities that FRSs had experienced over that decade. Accepting the need for this guidance the CLG tasked the CFRAU to review and update the current guidance. Dark (2011a), in his article, identified that fourteen projects had been initiated and by the date of the publication of the article six projects were more than twelve months overdue; the results of three of the projects had been delayed by over six months; and the

Operational Programme Board for the development of guidance documents had not met since March of that year, a period of seven months.

From the point of view of WB staff, their interpretation of their SOPs is that they are there for guidance rather than compliance but not all SOs the researcher spoke to had this same understanding and perhaps the best known example of this is the incident at the Galston disused mineshaft which resulted in the death of a member of the public. The incident commander at this incident interpreted the SOPs as being there to be complied with; a view supported by FRS POs at the Fatal Accident Inquiry. The HSE schedule LFB/2 related to the deaths of the two firefighters at Gillender Street in London included reference to "senior officers, line managers and supervisors to monitor **compliance**[17] with operational standards" reflecting the HSE's view is that SOPs are there to be complied with. However, circumstances do not always fit those described or written in the SOP; they cannot be so fully encompassing as to cater for all the foreseeable situations and combinations of circumstances that might arise.

6.3.1 Working on the incident ground

During the course of the fieldwork there were no substantial incidents that occurred for the researcher to attend and to observe the use of SOPs in a more complex operational environment. However, at a lower level the researcher was able to observe crews operating at smaller incidents mostly associated with the actuation of fire alarms, road traffic collisions, and small residential fires. What was observed by the researcher was that the lessons previously learned the hard way, the 'practical firemanship' based on acquired experience and passed down to new generations of firefighters, appeared to have been forgotten or were being ignored. For example, the siting of appliances on arrival had more to do with being in the best position to make a quick getaway once the incident commander had sent a stop message rather than the best position for the appliances to be in should the incident escalate and become a 'working job'. Another example was that a covering jet, in case of an emergency, was rarely deployed at these fires. This latter issue was identified during conversations with firefighters. They were aware that it was deemed as being good practice but they didn't see the need for it based on their own experience,

[17] Researcher's emphasis in bold text.

which tends to consist of relatively minor incidents. It was seen as something else that would have to be made up and put back on the appliance afterwards.

The view taken of SOPs by the firefighters was a more pragmatic one than that of some of the SOs in that they believed SOPs were there to be interpreted as guidance and not compliance. However, mention was made of newly promoted junior officers that lacked practical experience and were more cautious, or risk averse, in their actions making them more likely to view SOPs as having to be complied with. This may have something to do with what junior officers are being taught on their development courses. Respondents to the safety culture questionnaire were asked whether they believed SOs were stopping firefighters from carrying out their job because of health and safety concerns. An analysis of variance test indicated there was a significant difference between the role groups ($F(2, 809)=61.465$, $p=0.001$). Post-hoc comparisons using Tukey's HSD test indicated that there were significant differences between the WB group ($M=5.10$, $SD=1.546$), and both the SO ($M=2.64$, $SD=1.303$) and the PO ($M=3.00$, $SD=1.683$) groups. There was no significant difference between the SO and PO groups. For WB staff 72.3%, five of the forty-two SOs, and two of the thirteen POs indicated a positive attitude towards the statement. The strength of the attitude of WB staff was not as strong as the researcher anticipated based on the responses made in the focus groups and interviews. This may reflect the possibility of an increased number of firefighters tending to adopt a more risk averse approach and having become the new norm particularly as 33% of WB staff have joined the FRS since the FRS modernisation programme was concluded. If this is the case, one might expect that as the more experienced firefighters continue to retire this would be observed in a move in the attitudinal response to one that increasingly becomes more negative towards the statement, reflecting an increase in risk aversion amongst operational staff. Both the SO and PO groups, of whom the majority of respondents had joined the FRS before the modernisation programme in 2004, exhibited a different attitude to that of the WB staff with a more negative attitude to the statement. The researcher is reminded of the two experienced SOs that referred to the difficulty in their FRSs in getting both junior officers and some SOs to make timely decisions on the incident ground.

6.3.2 Exercises and simulations

The researcher observed that during the two exercises, the feedback from simulations, and from a major incident debrief, that operational staff, including WB staff and SOs, will follow and comply with the SOPs with a tendency to try and gloss over those parts that contradict the safe working practices contained in other SOPs or where they just do not fit the situation as presented to them. When asked whether these contradictions or circumstances where the SOPs cannot be complied with are reported it would seem that they are not, even by the MOs who are there for that purpose. It would appear to be an example of the failure of collective responsibility where assumptions are made that someone else will do it as opposed to taking the responsibility themselves.

Respondents were asked whether they agreed with the statement that operational staff are generally not familiar with all operational procedures and it was found that from the responses there was a statistically significant difference between the PO group with both of the other two groups, although having achieved statistical significance the effect size was quite small (r=0.008). Of the respondents 46.4% of WB staff, 23 of the 42 SO respondents, and 3 of the 13 POs indicated a positive attitude towards this statement. This indicates that the majority of POs believe their operational staff are familiar with their FRS SOPs yet WB staff and particularly the SOs believe there is an issue in regard to a lack of familiarity with the SOPs. Interviews, focus groups and discussions would suggest the issue is twofold, the first is the number of SOPs there are in the FRSs and the second is the lack of time to become familiar their contents and practice in the use of them.

Respondents were asked whether on the incident ground commanders will turn a blind eye to some safety issues if it means getting the job done. It was found that there was no statistically significant difference between the attitude scores of the three groups. Of the respondents 34.3% of WB staff, 47.6%, or 20 of the 42 SO respondents, and 2 of the 13 POs had a positive attitude towards the statement which is perhaps more of a reflection of the risk appetite of the three groups and how they might differently interpret the situation at an incident. What might influence this result is that WB staff and SMs are more likely to be faced with a dynamic incident and situation with potentially not all the risks known and risk controls yet to be fully implemented; an inherently more risk-laden environment than that the POs are likely to have to operate in by the time they arrive and take on the role of the incident commander.

The FRS has tended to try and meet the 'demands' of the HSE in that FRSs "need to manage all foreseeable risk effectively and to review their operational procedures in the light of experience" (Health and Safety Executive, n.d.-a, p1). This has resulted in some FRSs producing volumes of procedures and documentation that even the trial judge in the case of the fatalities occurring at the fatal fire at Atherstone on Stour made comments regarding the difficulty in understanding them and the contradictions between them.

What should be borne in mind are the different workloads associated with SOPs. As was pointed out to the researcher POs rarely train or practice in the role of incident commander. Even then they only have to get it right once to have demonstrated competence and the box is ticked so the demand on their time is less than for other operational personnel. There is also the question as to whether an assessor thinks it will help his career if he 'fails' the PO on his assessment. At most incidents, on the arrival of the PO, most of the uncertainties associated with a particular incident will have been identified and the correct SOPs will be in place and operating. The appropriate level of command support and specialist support officers will normally be in place that would not have been available to the first incident commanders as the incident was escalating. This takes a lot of the pressure off the POs in having to be familiar with the SOPs and having to practice them.

In conversation with a number of officers who were in, or had been in their FRS assurance role, a common theme at incidents they had attended was where a SO or PO was in charge of an incident; had communicated and resourced the chosen plan to the delegated officers and expected activities to be occurring in accordance with that plan, to then be surprised when informed that this wasn't the case. As one senior officer explained it "having been briefed on the situation, the plan, control structure etc., then walking around the incident it is as if we are fighting two different fires" As an incident commander FRS training encourages the incident commander to walk around the incident ground to gain an understanding of the situation, now referred to as situational awareness, before taking up a position at the established control point. This process is often referred to as doing a "360" as in a 360^{o} review of the incident ground. If they do not do this in simulations or at exercises it can negatively affect their assessment result. However, at some incidents this is not always appropriate such as that at the fatal fire at Marlie Farm involving the mass storage of fireworks. As incident commanders came on to the incident ground they would report in to the control unit and then proceed to go on a '360' around what was a

considerable area in accordance with how they had been trained and most likely to have been assessed on at some stage during their operational assessments. However, as was explained to the researcher there was an evident need at this incident, if they had prioritised correctly, to exert control over the FRS actions in what was still a very uncertain and very risky environment; there was an overall lack of control. This comment was made not intending to criticise the individuals but is perhaps a reflection on their potential lack of experience and the rigidity in following SOPs rather than understanding the situation and making more appropriate decisions.

This may also be the result of the training being provided by inexperienced SOs to other officers. One interviewee, a member of his FRS's assurance team, informed the researcher of an occasion when the whole of the assurance team volunteered to undertake all of the incident commander roles, from the first to the last incident commander, for a computerised simulation exercise. The Group Manager (GM), the lead on incident command in that FRS and assessing the assurance team on this occasion, was quite happy to step back into the waiting room and declare that the second officer when taking over command from the first incident commander had failed as he had not retained that officer as part of his overall command team and keeping him in close proximity to himself. Instead he had tasked him to take charge of the crews operating at the face of the fire. The GM assessor had made an assumption based on the contents of the Fire Service Manual for Incident Command. It was suggested that this second incident commander had made a risk assessment and from which he had determined the greatest risk was presented by firefighting operations at the front of the fire and he had used the first incident commander to exert close control of the crews operating in the danger area whilst awaiting reinforcements, including additional officers. This proved to be the case in the following debrief. Later, the assurance team had checked their operational data and could find no record of this GM, who was running and managing these simulations, as having been an incident commander in the previous six year period during which data had been collected.

6.3.3 Decision-making

When the Decision Making Model (DMM) was originally taken to experienced WMs in the London Fire Brigade and their first comment was "But that's what we do anyway". The DMM had captured the naturalistic decision making of these fire officers. The DMM was

subsequently introduced to all the officer development courses and to new recruits with training provided to WB staff at a local level. Operationally, the model was being used as a means to inform decision making, handover command of an incident to another officer, or in providing briefings to other officers and crews. The use of the DMM provided a structure that facilitated the exchange of information both in giving that information and in receiving it. It was also being used as a tool to conduct post-incident debriefs of incident commanders to identify both good and learning points in their role at an incident.

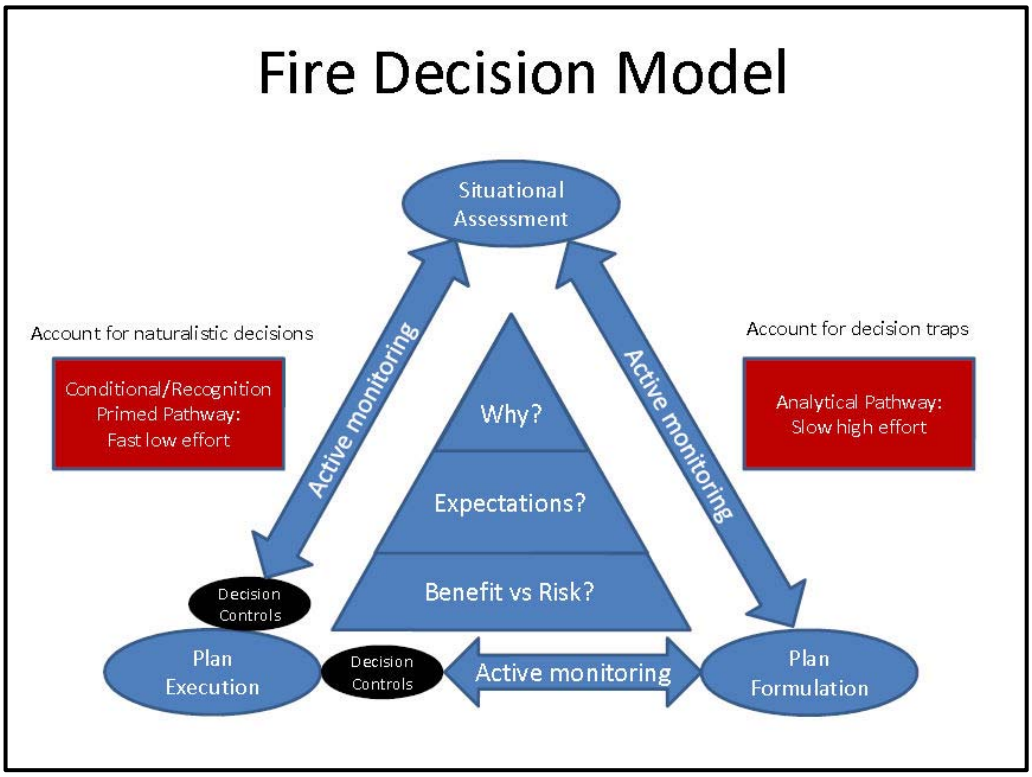
When introduced to recruit firefighters the DMM has initially been taught as a linear model in the form of a flow chart (the researcher was involved in the delivery of this training) to enable them to become familiar with, and to understand, the model and its component parts. Experienced fire officers familiar with the DMM will tend to use the model in a non-linear manner and enter the model at any point relevant to the new information being offered and then might navigate their way through the model in any direction. The DMM is a reiterative model in that it is used time and again to review progress and the impact of new information. It is also scalable in that it should be used by all ranks on the incident ground from firefighters who are more likely to use it as a mental model, especially in relation to their own risk assessments, to the most senior officer present where it would be in a more detailed written format. Each DMM is interconnected in that if the firefighter does not have the authority or the resources to deal with an issue he will pass the issue up to the next level of command and it is incorporated into that officer's DMM which will be used to inform that officer's decision regarding the issue. In the same way, if a firefighter identifies a risk that he could not deal with, or others needed to be informed of that risk, he would be expected to pass that up to the line manager in the same way that risks within enterprise risk management are escalated. If the individual is a sector commander then that person's DMM is automatically the DMM for the sector and similarly for the incident commander. An example of how one English FRS has used the DMM as the basis for its Incident Command Wallet carried on all pumping appliances is shown in Appendix 6-1. The Fire Service College has taught the use of the DMM to a generation of fire officers based on the incorrect interpretation of the DMM as being a linear model, that it was only for use by incident commanders, and that it was not a reiterative process (Arbuthnot, 2011; Cohen-Hatton, 2014). The researcher contacted seven of the eight members of the team that developed the DMM to confirm the researcher's understanding of the model. The consensus was that the DMM was never intended to be a linear model in its use and that it

is to be continually reiterated through as even when there are no new inputs it can be used to confirm the incident commander's situational awareness.

The Decision Control Process (DCP)

The first draft of the DCP model was originally called the Fire Decision Model (FDM) which was developed to replace the DMM and resolve the perceived issues with that model. The DCP has now been published in The Foundation for Incident Command (Chief Fire Officers Association, 2015b).

Figure 6-1. The original draft of the Fire Decision Model.



Source: Copied from the presentation made to the Institution of Fire Engineers (Scotland) on 4/6/2014 at the Strathclyde FRS Training Centre, Cambuslang.

In the presentation of this model the FDM (Hatton-Cohen, 2014), in Figure 6-1, it was described by the author of the model as bridging the gap between academics and practitioners. The officer making the presentation confirmed the DMM model was a linear model and that it was only used once, on arrival at the incident, by the incident commander; these were both incorrect assumptions. It would appear that since that presentation and following the consultation phase the author of the FDM model has

listened to the constructive criticisms made and the final version of the model has been overlaid with the component parts of the DMM as was shown in Figure 4-8 and renamed the Decision Control Process as a result.

The result is we now have two models, the DMM and DCP, serving two purposes incorporated into the one model. We can see that the academic points regarding pathways have been removed and the key points of the original DMM incorporated. In the centre is a triangle highlighting three questions. The researcher believes this central triangle asking these questions were included within the DMM itself as was being taught in the LFB in the mid-1990s:

- Why we are taking a certain action?: This is related to achieving our **objectives** in accordance with the overall plan.

- What are the 'Expectations'?: the use of milestones as used in project work identifying how we will measure progress as part of the **evaluation** process.

- What are the 'Benefits versus Risk' of having taken that action?: This relates to the use of the DRA under **Hazards and Safety**.

  The decision traps relate to the following:

- Decisions made do not fit with the actual incident objectives, goal or tactical plan: This is certainly a risk in the bureaucracy and administrative world and on the 'cold' side of the FRS where individuals or teams might supplant, or subvert, the organisational goals with their own objectives for their own benefit. However, on the 'hot' side of the FRS, while attending incidents, this is less likely to be an issue.

- Decision does not take into account the overall picture: This can occur with inexperienced officers, usually under stress, when they tend to revert to an operating mode that they were last comfortable operating in. This trap is captured in two expressions: 'some officers stand so close to the wall all they can see are the bricks rather than taking a step back and looking around the wall'. The second is very similar in that 'you can't see the wood for the trees'. Both describe a situation when the incident commander gets too involved in the details instead of taking a wider overview. Experience is the key to overcoming this trap.

- Decisions based on the wrong interpretation of the facts or poor situational awareness: This can be down to the information not being communicated accurately, and incorrect weighting being applied to the information, all associated with a lack of experience and confirmatory bias.

- Decision aversion normally occurring when the focus is on future accountability and scrutiny: The author points out that this is an outcome of being risk-averse and being reluctant to make the decision. The researcher believes the causal relationship should be reversed to reflect that it is the focus on accountability and scrutiny that will cause the individual to become risk averse. Risk aversion can also be down to a lack of experience if the decision maker has never encountered this type of situation before in which case they are likely to be more cautious and risk averse.

- The final decision trap is a failure to actively monitor and review: this was a constituent component of the DMM and was taught in the LFB as establishing 'milestones', i.e. that progress, or change, could be measured against what would be expected if the overall plan is appropriate and working.

Pessemier and England (2010) refer to the use of these triangular models as being associated with academia and a retired SO engaged in his own PhD focussed on firefighter safety has commented that he believes the DCP is too focussed on its potential use by academics. The researcher has been in contact with the occupational psychologist (Burke, 2014) who originally produced a paper on the DMM and who would support the opinion, in regard to the original FDM, that it may be better suited to explaining a process and decision traps to an academic audience, which he contrasts with the FRS practitioner that the DMM specifically addresses. Since the published DCP retains the DMM elements the researcher assumes that the DMM can still be used as long as the user of the model remains cognisant of the decision traps. This researcher would have preferred the author of the DCP to have included reference to biases such as confirmatory bias, overconfidence, and attribution error. In the view of the researcher, taking into account the simplicity of the DMM, and that it replicates the naturalistic decision making of FRS operational personnel, then the DMM remains the better model for FRS practitioners. Even its most prominent critic (Arbuthnot, 2011) has previously admitted it is useful as a training tool. The DMM could, and should, be

modified to incorporate the three elements of incident information, resources, and safety and hazards within a larger component part labelled 'Situational Awareness' so as to explicitly link it to the research that has been conducted in that area.

The trial judge of the fire officers charged with negligent manslaughter following the Atherstone on Stour fire declined to use the phrase 'Dynamic Risk Assessment' (DRA) and the researcher would agree with that as it is just a risk assessment that happens to occur in a dynamic situation. For as much as FRS officers might like to refer to the term 'Analytical Risk Assessment' (ARA) it is being used in the wrong context. Risk assessments on the incident ground, the 'hot' side of the FRS, no matter the seniority of the officer in charge of the incident, continue to use the DRA process, based on their subjective experience, and not the ARA. As the incident progresses and resources become available there is the expectation that the records of these DRAs will become more detailed. The term ARA is one better suited for use on the 'cold' side of the organisation when there is the time and the facilities, although nearly all FRSs lack the skills and software, to conduct a thorough analysis of the risks associated with informing decisions using sampling techniques for simulations, such as Monte Carlo and Latin Hypercube, which are commonly used in specialist software, to inform organisational decision making.

6.4 Competence

As a response to the Improvement Notices served on the LFB by the HSE after the firefighter fatalities at Gillender Street, the LFB was the first UK FRS to develop a competence based programme. This was titled the Integrated Management Development Programme and was subsequently adopted nationally as part of the FRS modernisation programme under the new title of the Integrated Personal Development System (IPDS). The CFOA Position Statement on IPDS (2010) informs us that "IPDS provides a structure, based on agreed standards of performance, within which organisations can identify, attract, assess and develop people to fulfil their current and future roles".

6.4.1 Integrated Personal Development System (IPDS)

IPDS was introduced to cater for the different rates at which people learn and become skilled in the use of their equipment. This was referred to as Underpinning Skills and

Knowledge (UPSK). It was thought that once a person had developed competence across the elements in their role then, for a firefighter, they should be paid the additional Qualified Firefighters rate of pay and not be reliant on an arbitrary time frame. This was a view readily supported by the FBU as it meant they had won for their members the additional payment in a shorter time frame. Previously, it was seen as an achievement to have demonstrated you were a Qualified Firefighter[18], including a sense of pride, based on the acquired knowledge, the skills to use that knowledge, and the experience to know how and in what circumstances to apply it; you had passed your apprenticeship. It was reported to the researcher that the focus of firefighters is now on achieving the financial reward associated with the qualification as quickly as possible rather than broadening their skills base and experience. IPDS tends to be operated or 'owned' by the personnel or training department dependent on the organisational structure of each FRS. There have been a number of issues arising from its use including the time and resources it takes for each individual to put together an evidence portfolio. A PO interviewee recalled being in the company of two other POs, both of whom had themselves been instrumental in implementing the IPDS into their FRS, who questioned the outcomes of IPDS asking "Why is it we can't seem to get the right people promoted?" HMFSI were aware of issues associated with the IPDS from their previous inspections including evidence that WB staff were condemning perfectly good equipment just so that they could demonstrate their competence in the process for that part of their rolemap portfolios. HMFSI expressed concerns that the focus of individuals appeared to be solely on IPDS to the detriment of other activities in line with FRS mission statements, aims and objectives. As one ex-HMFSI informant told the researcher it appeared that "Nothing was getting done unless it was a requirement for someone's portfolio". Certain anomalies have occurred with the promotion system being run by the non-operational staff in that the researcher was informed by a SO that there remains the difficulty in verifying the portfolio of evidence of competence and particularly in regard to plagiarism. As one PO acknowledged, this evidence could reflect the one time the candidate got it right out of fifty attempts. The other forty-nine failed attempts are not taken into consideration.

[18] To be deemed 'qualified' a fireman had to have served four years and successfully passed a training module for each of those years. Each module provided the technical knowledge to acquire certain skills and during that time practical qualifications such as pump operation, driving, special appliance operation, breathing apparatus, first-aid and fire prevention for which the fireman would have to have passed proficiency tests to demonstrate his proficiency.

Members of different FRSs in all roles believed that IPDS had not met the expectations that they had been led to believe could be achieved. This should come as no surprise to the London Fire Brigade, the FRS that developed the IPDS, as the same issues that arose during the course of this research were revealed to LFB senior management in a report by external consultants (McCrorie, 1996). This report only had a limited circulation and was never made available to the firefighters' representative body, the Fire Brigades Union. Relevant points from that report are summarised as:

- Relatively inexperienced people can be allocated responsibilities they're ill equipped for (p18).
- Difficult to have confidence in young officers – some lack experience and common sense – they dither (p19).
- Experience is being lost as older staff leave and recruitment slows. Fewer fires means less opportunity to gain experience (p20).
- Some managers lack the skills to support the development of their people (p24).
- Training and development are key issues – are we putting in enough resources (p25).
- Sceptical of assessment centres – are they delivering the right results? (p26).
- Unbalanced weight given to assessment and interview, versus experience in post and recommendations from senior officers (p26).
- Concern that assessment centres are biased – impression that goal posts move reference expectations[19] (p26).

Gabriel (1985, p14) informs us that the US Army experienced similar issues regarding the promotion system that affected the ability of the US military to mount successful military operations from the Vietnam era for the next twenty years; a system where military leadership and expertise had been "replaced by managerial technocrats" and bureaucracy. Gabriel referred to 'Yasotay', a pseudonym for an individual that was later identified as being a US General of Special Forces, who believed it was the clerks (managers) that were

[19] The London Fire Brigade supported the introduction of assessment centres to counter the perceived nepotism that was believed to favour operational officers. Others now suggest that nepotism is still prevalent just that it is now owned by a different function within FRSs.

now in charge of the army; that it was human resource managers that designed and were in charge of the system of promotions that benefited the managers whilst penalising the warriors. This was the same issue that resonated with many of the interviewees and particularly during discussions with WB staff in relation to the system of promotion within the FRS.

At Watch level, a number of firefighters expressed a view that they were unlikely to put themselves through the hoops that IPDS required for promotion, and they would often refer to individuals on their Watch that should have been promoted but for the hurdles associated with the IPDS process. This view also extended to SOs who identified individuals that should have been promoted but have had difficulties in passing elements of the assessment centres. A SO described the issue as being the assessment process is unable to identify those individuals that are actually the workers, or to differentiate between those that are able and willing to get the work done to meet, or contribute to, FRS objectives from those that do just enough to satisfy the requirement for their own portfolio of evidence. One SO admitted that he and a number of his peer group had sought transfers to their FRS's training department as it provided them with greater access to the computerised simulations to practice on. This allowed them to gain a better understanding of what was required by way of the language and terminology to 'hit the right buttons' in putting together their portfolio and application. With regard to the computerised simulation many had learned to 'play the game' in how to successfully pass the simulation; they knew the shortcuts to successfully negotiate their way through the simulation and the assessment, but this is of no practical use on the incident ground. The researcher has previously asked SOs in the FRS training function whether the use of simulations has been tested using a control group as part of an experiment to see if it was more accurate than other means to assess competence in incident command. No such experiments appear to have taken place and it would seem their use has been based on unconfirmed assumptions. A question was also raised about what else might be affecting the results of the simulation, particularly in regard to different forms of stress. One SO informed the researcher that in his FRS there was evidence from the incident ground that some individuals that had passed the operational assessment with flying colours, indeed with top marks, could not replicate that performance on the incident ground, whereas others who had performed abysmally on the simulation were in reality some of his FRS's best incident commanders. When asked about this he attributed it to the different types of stress between taking an assessment

and ‘doing it for real’. In a simulation nobody gets killed, you don’t have people screaming at you, or crews that want to do their own thing contrary to your plan, all of which may require some strong action, and certainly a show of resilience, by an incident commander. This relates to the points made in the literature review and commented on by a number of SOs regarding more junior officers continually failing to make a decision and instead they become focused on continually gathering more information; the same comments were being made by WB staff of some of the SOs. The operational experience of those assessing simulations and in making what are subjective judgements was an issue that was also raised by both junior and some SOs. One SO informed the researcher that staff in their training department had criticised officers being assessed based on their compliance or lack of compliance with SOPs. There was no attempt made to question the reasoning behind those decisions as to why they had not complied with the SOPs particularly as some of those decisions appear to be quite rational in the circumstances that were presented at the time. The assessment criterion was whether they had complied or not. This gives an indication as to how this and many other FRSs have interpreted SOPs as being there for compliance as opposed to them providing guidance. Other interviewees commented on experience, or the lack of, particularly in regard to SOs. One PO stated that he was aware of a SO not having attended an incident in the previous six years. Another interviewee, also a SO, identified a colleague who as a newly promoted Group Manager (GM) had never been in charge of a ‘make-up’ in his career. This last example the researcher would like to think is an extreme case.

Other interviewees had similar views of IPDS. One PO, on being asked whether there were too many people with a vested interest in IPDS, viewed it as an example of where the English FRS has:

> “created an entire industry that has cost a fortune to service… (*that the FRS*) has slavishly followed the methodology... I believe inherently in the process and the underlying principles are unimpeachable and it’s fine… but it’s over engineered and it doesn’t work in that way. It was not producing what it purports to do.” The interviewee explained that this over-engineering was the result of trying to “take judgement and subjectivity out of the process and I don’t think you can actually do that. IPDS was almost a means for people to abdicate their responsibilities from making judgements… (*FRSs*) would be running assessment centres for a middle ranking position and it would have cost them something like £6000 to make the appointment because they had to run so many people through it. Instead of saying no… come on, we know it’s going to be one of these five. So why are we bothering to spend all that public money on these other 73

people who we know are not ready to do it (*the role*). So we were abdicating our responsibility as leaders and hiding behind IPDS."

This makes the researcher question whether the FRS has become process driven rather than outcome driven. If the outcomes are not what has been expected the FRS should change the process. The researcher is aware of at least one English FRS that has dramatically revised how they use IPDS, taking what they believe to be is a more pragmatic view in light of their experience with using it.

There is a question regarding the use of IPDS and its contribution to equality and diversity. One of the objectives of the forerunner of IPDS was to remove the influence of nepotism particularly from what was seen as that exercised by officers in the operations function. Some interviewees now believe all IPDS has done is transferred that 'power' of promotion, that source of nepotism, from Operations to that of the Personnel function. As one SO interviewee stated "It seems the best incident commanders are all in Personnel… shame they can't do it on the fire ground". Another PO stated that he thought IPDS has not worked for the FRS and that it has become a "paper chase" that differs between stations let alone between internal and external FRS verifiers. He believed that "the old system could be described as being prescriptive, but there was value in that anybody who passed was perceived to be at a similar level. You certainly don't get that sort of comfort from the IPDS system." This PO also highlighted that there remained an issue about teams in that all members of a team having demonstrated competence doesn't necessarily mean the team will be effective. A team will demonstrate emergent properties above those held by its individual members. IPDS was not designed with the competence of teams in mind but the competence of the individual. This was based on previous research relating to the airline industry and used as the basis of a number of dissertations written by potential POs as part of their Brigade Command Course at the Fire Service College (FSC). The theory was that if all flight crew members were deemed competent then flight-crew teams would also be effective. A good example, that refutes this, is that of Snook (2000) who looked at the shooting down of two Black Hawk helicopters by two US F-15 fighter aircraft. One of the major contributory factors was the performance of crew of the AWACS aircraft that provided an airborne command, control and communications station. Snook found that although the individual crew members were individually technically qualified for their role, i.e. they were each competent in their role with some even at the level of instructors, they had been assembled in an ad hoc manner and were not prepared for, or identified with, an

agreed “sense of mutual responsibility and accountability for collective outcomes” (Snook, 2000, p105). No consideration had been placed on their readiness to be able to undertake operations as a team. Snook concluded that rather than there being ‘emergent properties’ it had the opposite effect and they were less effective than the sum of their individual competences. He described the team as a ‘pseudo-team’ which Katzenbach and Smith (1993 in Snook, 2000, p105) define as “the weakest of all groups in terms of performance impact. They almost always contribute less to company performance needs than working groups because their interactions detract from each member’s individual performance without delivering any joint benefit. In pseudo-teams, the sum of the whole is less than the potential of the individual parts”. The comments could just as easily be applied to appliance crews in some FRSs as it could to the FRS command structure adopted at an incident.

One SO, who had worked in the training function in a SO role, believed that IPDS had now become a report writing exercise but what it was missing was the realistic training, although he did recognise that it is difficult to replicate the conditions and circumstances you are foreseeably and most likely to come across on the incident ground. He thought that the FRS had lost its ‘practical firemanship’, that is its professionalism, over the last decade or more. He was confident that the FRS will still extinguish the fire, and as he said “After all, how many outstanding fires are there that have still to be dealt with?” However, limiting the damage from the products of the fire, such as smoke damage and as a result of firefighting actions such as excessive water damage from the FRS hoselines, seems to be missing. This officer went on to express the view that there is so much going on, particularly at complex incidents with multi-agencies being in attendance, that the provision of incident command support to the incident commander is now critical. This is a view that has been expressed over many years, in different FRSs, by different officers, and would certainly be a role that would be better suited to the ‘manager’, rather than the ‘leader’, to manage the various systems at larger incidents on behalf of the incident commander. One has only to look at the military to see the benefit of command teams that work and train as a semi-permanent team rather than be assembled on an ad-hoc basis when required. A second SO interviewee, who had experience in the training function as a SO, also agreed that the IPDS has not been successful and stated:

> “We try to take what was being used externally by others for *(use in)* the fire rescue service. Has it produced better firefighters? No, I don’t think it has. We’ve taken a firefighter, given them a basic 16 weeks training; the implication for the individual is

> they've been taught to pass the NVQ, but have not been trained to be a firefighter. The firefighter's attitude is all about passing the NVQ and how do I get my money (*obtaining the additional monetary award*)? IPDS is seen as just a hurdle to get over."

This officer offered the following opinion on IPDS:

> "Rank to role and IPDS were one the worst things that has happened to the Fire Brigade. One has devalued the value [*status*] of the officer on the fire ground and the other has brought in a promotion ladder for people to climb as quickly as possible [*without becoming skilled in operations*]."

At Watch level whilst conducting focus groups, comments were made regarding selection and how some believed the standards had declined under IPDS and the use of assessment centres. There was a general belief that individuals were being promoted before they could effectively carryout their current role leading to some having been 'over-promoted' or described as having 'a massive lack of experience' and that it was thought to be particularly prevalent across the flexi-duty officers (i.e. SOs). In the focus groups it was very apparent that the level of competence of some newly promoted officers was being questioned, and an area of concern to, the WB staff.

In one FRS, whilst taking the opportunity to talk to WB personnel, it was noted that they alternated between using the old style rank designation of 'Station Officer' and not the correct term 'Watch Manager' as used in their FRS. The researcher initially thought it was to do with when an individual had been promoted, either under the old rank system or the modernised system of roles and IPDS. On enquiring further with the firefighters and the junior officer present the researcher was informed the term 'Station Officer' was used as a mark of respect paid to the individual based on their operational competence regardless of which system they had been promoted in.

IPDS remains difficult to challenge as so many officers in the English FRS have gained a number of promotions from having been associated with its development and introduction across the English FRS so they remain protective of it. Despite the downside of IPDS it has made a positive contribution to the FRS in that it has formalised the various elements associated with the new roles as contained in the occupational standards. These then allowed the development of agreed standards of training across the different FRSs for both WT and On-Call (OC) firefighters. Bain et al. (2002) concluded that IPDS did not measure the skill of the individual but how the individual applies those skills in their work environment.

Many FRS staff would question the validity of this statement based on their perception of the outcomes of IPDS.

6.4.2 The role of experience

WB staff and some SOs linked competence and experience together and it was a constant subject of discussion when recalling incidents as to whether it was 'a good job', that is the FRS performed well, and why things went wrong. It is this lack of experience that the researcher heard mentioned by WB staff and SOs in regard to the rapid number of promotions individuals could achieve in a very short space of time. Older firefighters spoke of having gone through an 'apprenticeship' based on the four year period before you could become a qualified firefighter. This would not always be a valid view as firefighters in more rural locations could not expect to have learned the lessons and gained experience of firefighting in basements three floors below ground level or in high-rise blocks of flats or offices. Equally, not many inner-city firefighters would have been involved in rescuing large animals or dealing with persons trapped in grain silos and at risk of being submerged beneath the grain. However, in a period of four years one could be expected, as one firefighter explained "to have learned your craft" relating to FRS activities you were most likely to have to deal with in your local area.

Can this experience obtained over the decades within the operational workforce and now being lost as firefighters retire be re-learned? Four POs thought that there were still elements with this experience in their FRSs but they also thought the FRS in general was past the 'tipping-point' as one described it. It was thought that the corporate knowledge of practical firefighting had seriously been eroded and that to reacquire this experience would require some form of specialisation and expensive training limited by the risks that firefighters could be reasonably exposed to in training. Alternatively, the other option is for FRSs to become more defensive in its nature and focussed operationally on just preventing the spread of fire to adjoining premises or surrounding risks rather than putting the fire out by the use of offensive, i.e. internal, firefighting tactics. This would require a change in the expectations of firefighters, FRS managers, and the members of the public. One PO informed the researcher that currently there is a focus on what technology has to offer. A number of his colleagues are looking at firefighting systems that could be used by firefighters, not just to make their working environment safer for them to operate in, but to

help balance that loss of expertise in offensive firefighting by not having to expose inexperienced firefighters to the same risks of firefighting that they presently are.

With the increase in firefighter fatalities there is an increased need to make firefighters aware of the risk on the incident ground, particularly at fires, to themselves and their colleagues. Chamberlin (2005; in Holgate and Clancy, 2009) speaks of firefighters sharing their portal stories i.e. storytelling, and sharing those events that were serious near misses, and how those experiences have changed their attitude to the risks they face. There are two issues with this view. The first is that, as the researcher found during his fieldwork there are very few individuals remaining in the FRS that have had these experiences. The second is that the few older firefighters with portal experiences think the newer generation do not want to hear these stories. For the new generation of firefighters, who tend to be the less experienced firefighters, their own experience of the incident ground tells them that, yes, there is the possibility that they could be seriously harmed but the chances of it happening to them are extremely small. With this attitude there is the potential danger of some firefighters becoming over-confident in their abilities and potentially increasing the probability of such an event occurring as they put themselves unknowingly at increased risk. Of the five FRSs that participated in this research none had suffered a firefighter fatality during firefighting operations at a fire since 1978. That is a thirty-nine year period, which is nine years longer than the thirty year career for most operational staff before they retire.

6.4.3 Station Drills

FRS modernisation has seen a reduction in the number of hours devoted to the training of WB staff. As one WM explained, once everyone has demonstrated competence there was no longer the need to keep practicing the drills and that time that has been freed up was then used for Community Fire Safety (CFS) work. This may also reflect a point raised in the LFB operational strategy document (1993b) in which the authors found that much of the continuation training consisted of repetitive individual drills based on simple fireground scenarios. They concluded that this provided an “insufficiently realistic simulation of the actual operational situation and does not regularly bring together the combination of events and conditions found at real incidents” (1993b, p5). This comment has since been referred to elsewhere a number of times but it fails to take into account the context at the

time of that report and the purpose of station drills as perceived by WMs and SOs. At that time the LFB had very basic training facilities and this document, and particularly this section within it, provided the basis for the business case that saw the building of a major new facility in London allowing for hot-fire training to improve the training and its scope.

Repetitive station drills have previously been used to see if a watch or individuals were getting 'rusty' indicating a need to revisit these activities, and as part of a 'warm-up' to dust off the mental and physical cobwebs before proceeding to more complicated drills. One SO spoke of having just been posted to a Watch at one of the busiest stations in his FRS as the new CM and being mobilised with his appliance and crew to a person locked out at the first floor level of residential flats. He ordered the 105 ladder to be slipped and pitched[20] to an open window by the remainder of the crew whilst he took details from the occupier. As he turned around his 'experienced' crew had pitched the ladder upside down — they had not used or practiced with the ladder in so long a time they had lost their competence in what is a relatively simple drill movement. Another reason station drills are used is to build on what many refer to as 'muscle memory' in that it allows you to carry out a sequence of actions without having to consciously think about it. In military and sports parachuting the motions for pulling the main or reserve parachute are constantly being practised before making a jump to engender muscle memory. In a FRS context a number of firefighters will have found themselves, tying a complicated knot or a sequence of simple knots under pressure on the incident ground with other firefighters yelling and members of the public screaming, which is a lot different to doing that on the station drill yard. WMs would often be yelling at you during the process whilst on the drill ground at the fire station to provide a level of stress. When coupled with the pressure exerted by the rest of the crew to get the drill completed as quickly as possible out of professional pride this was deemed by interviewees as having been good preparation for actual events on the incident ground. Weick (1985 in Snook, 2000, p93) explained that "extended practice produces automatic rather than consciously controlled processes" with a philosophy based on individuals being able to perform instinctively and without having to think about the process under high-levels of stress. However, Weick does warn us that if these skills are only trained to the point of sufficiency, in IPDS this would be to the point of having achieved competence, then whilst WB officers and SOs might assume their staff are competent the reality is it will soon

[20] That is the 10.5 metre ladder was removed from the appliance and pitched at the appropriate angle to the height it is going to be used at.

disappear under pressure. FRS trainers or FRS staff are no longer allowed to apply stress by shouting as part of the positive action by the FRS to recruit from underrepresented groups in the community and in relation to FRS policies on bullying and harassment.

Reason (1997) also supports the continuous practice of skills so as to preserve those skills for when they are required. However, he warns us that in a system in which those skills are rarely required, coupled with the loss of opportunities for individuals and teams to practice them again and again over time those individuals will become deskilled. He also refers to Bainbridge (1987) who pointed out that the most successful and robust systems requiring little in the way of manual intervention may require the greatest level of investment in training to maintain operator competence. Roberts (1989 in Sagan, 1993, p173) identified the requirement in High Reliability Organisations for redundancy in systems and the provision of suitable training both of which can be associated with high costs. She informs us that "when hazardous organizations cut corners on either of these issues disaster is likely to occur."

6.5 Work pressures

Pressure of work on operational staff comes in two major forms, the first is associated with their non-operational or administrative roles and the second, their operational roles.

6.5.1 Senior officers

For POs their stress is associated with the management of their FRS in the local political environment. Implementing the FRS modernisation programme was a stressful period, particularly the assessments under the Comprehensive Assessment regime of the AC which were an unknown quantity at that time. For the last seven years stress has been focussed on managing the demand for austerity cuts from central government and channelled through to the FRS via the FRA of the local authority. Knight (2013) recognises that for POs the issue is one of taking into account and managing the local politics, the public's attachment to their local fire stations. The researcher would add the representative bodies, particularly the FBU, none of whom want to see station closures, loss of appliances, redundancies, or increased delays before appliances arrive to the scene of an emergency. The SOs tend to find their time typically used in the review of different activities, problem

solving, project work, and in meetings within the FRS or with outside agencies such as other blue-light services. Some FRS staff suspect that it is this side of the organisation that a number of officers focus their attention on rather than operational activities.

Operationally, the workload on POs is much reduced as the number of major incidents requiring their attendance has been considerably reduced. At the incidents they are mobilised to, their role is more often as the FRS Gold Commander which would entail them being not on-site at the incident but at a remote location usually established and resourced by the local police authority that provides communications, IT, and other resources associated with any modern command, control, and communications facility. Even in this environment a PO will be supported by other FRS officers and non-uniformed staff as deemed necessary by the PO acting as the FRS Gold Commander. Their role is predominantly a strategic one involving negotiations, joint working and representing their FRS.

SOs will tend to operate as the incident commander at incidents that are primarily attended by the FRS and at which additional appliances are requested by the first attending officer. At major, multi-agency incidents they may be required to adopt a different role title, the FRS Silver Commander. The role is to take command of the FRS resources at an incident at an operational level and to work with their counterparts in the other emergency services, such as the Police Silver Commander, and their equivalents in the non-uniformed agencies that might be in attendance. By the time the FRS Silver Commander is in position the plans, resources, and controls can be expected to be in place or enroute so the stress is different to that of the first incident commanders. SOs may also be called upon to undertake a FRS Bronze Commander role responsible for a specific task or sector of operations on the incident ground at the tactical level under the command of the FRS Silver Commander.

6.5.2 Watch based staff

With the reduction in the number of calls that the FRS now attends the researcher was informed by a number of WB officers, and firefighters that this free time is now being taken up with the planning, administration and work associated with CFS initiatives. This was not what the researcher observed on two of the three watches he was with whilst conducting the fieldwork. However, one particular CFS initiative, the HFRC, is being reduced and with it

the demand on the time of WB staff, as the majority of properties in the prioritised areas have been visited and smoke alarms fitted. They still have the spare capacity, if properly planned and managed, to carry out other tasks or activities.

One point constantly being raised by WB staff was the number of crew members on an appliance and that FRSs had reduced them to what they described as an absolute minimum. They explained that as they arrive, perhaps with a single appliance awaiting a second appliance from another station, they have a range of tasks that need to be undertaken with only three crew members and the WB officer available. As the officer in charge the CM or WM has to build a 'picture' of what is occurring (situational awareness) trying to stop people entering the premises, issuing instructions to the crew; the pump operator is engaging the pump drive on the appliance, sending priority messages, possibly dealing with casualties, and trying to lay out a hoseline and jet before having a BA board thrust into his hands by the BA crew to record their entry into the building. This is without having had to pitch a ladder to an external wall if required to gain access, or to assist someone down from an upper floor. If the crew is lucky the driver of the next appliance to arrive, which maybe twenty minutes away, will set in to a water supply and connect it to the pump from the nearest hydrant. Failure to do so risks the BA crew losing their water supply provided by the water tank on the appliance whilst fighting the fire which will increase the risks they face. This may give the reader some idea of the work pressures on the first appliance crews and an idea of why shortcuts are taken that may affect firefighter safety. WB staff have the greatest exposure to physical risk such as becoming a casualty, or a fatality, if the unexpected occurs at an incident.

This chapter identifies the main events and issues that the researcher considers may have had a contributory influence to the situation that has developed where over a period of ten years an unprecedented number of firefighters from English FRSs have lost their lives whilst fighting fires. During this period FRSs experienced the loss of approximately 25% of its experienced WT operational staff the FRSs in England underwent one of the largest change programmes experienced in the public services which absorbed the focus of the FRS leadership, its workforce, and key stakeholders. The FRS has been viewed by central government as not having made the change progress required since the modernisation programme was initiated in 2004 and their continued role and its governance has been called into question with the likelihood they will be replaced by PCCs, certainly in some

FRSs. At a national level there is no effective scrutiny of the FRS with the demise of HMFSI and shortly afterwards the AC who had assumed responsibility for inspections of the FRS. Currently, CFOA and the LGA arrange peer-reviews at the request of their members raising questions regarding objectivity and independence. Many FRSs have downsized or removed entirely their own operational assurance teams and replaced them with a monitoring system that is open to bias and inaccurate reporting. FRS safe working systems, their SOPs, cover an extensive range of potential and foreseeable activities resulting in the production of a library of SOPs that make it difficult for FRS staff to recall and to remain familiar with and practiced in each SOP. There still remains an issue as to whether FRS staff should view these SOPs as being there for compliance, or for guidance. The availability of and access to realistic training for operational staff is a concern certainly to WB staff. The introduction of IPDS has been criticised by individuals across all roles, not for its concept, but the bureaucracy it has engendered, the focus on the individual at the expense of team working, and that it appears designed to produce managers and not leaders which has affected trust and confidence between WB staff and SOs. As the time and resources commitment to the HFRC initiative by WB staff has been substantially reduced instead of using that time for re-training and addressing operational issues central government is looking for cost savings to be made within the FRS leading to reductions in the numbers of FRS stations, appliances and staffing levels.

The following chapter takes these findings and uses them to make a series of conclusions that offer some insight into the safety culture of the English FRS and why it is situated where it currently is. It will highlight the differences between the three key role groups, and what might need to be considered either to bring the FRS to a level of preparedness to enable it to meet the expectations of its key stakeholders whilst maintaining the safety of its firefighting staff; or failing that to aid in tempering those stakeholder expectations.

Chapter 7 Conclusions and implications

This chapter contains the conclusions for this research and looks to identify what the implications are for the English FRS as it continues to evolve to provide the service that is required and one that is affordable. The chapter is formatted in the same way as that used in the Findings and Discussion Chapters to make it easier to follow threads between the chapters i.e. the four dimensions of FRS safety culture: management, procedures, competence, and work pressures. This is followed by a section reflecting on the research methods and the final section relates to areas of further research that would contribute to a more complete understanding of some of the issues affecting the FRS in its continued evolution.

7.1 Management

At a national level there remains some uncertainty as to the positioning of the FRS within government departments. The CFRA is already under the jurisdiction of the Home Office as of January 2016 and the Conservative government appears intent in placing local FRSs under the control of local Police and Crime Commissioners (PCC). The operational demands on the FRS have been declining to the degree that WB personnel are reporting that the number of calls they attend has been reduced by nearly half and this is supported the CFRA who informs us that the reduction is at approximately 48% but there had been no similar reduction in FRS costs as a result. However, the Fire Prevention Association also asked, if the numbers of fire calls are reducing as are the size of fires, why are fire losses increasing? This raises further questions regarding the effectiveness and efficiency of firefighting operations. The central government was responsible for the programme for the modernisation of the FRS which introduced the change of FRS focus from one of being reactive and utilising FRS staff time to proactive community safety initiatives; changes to WB rota systems; the introduction of the Integrated Risk Management Plan designed to match the level and the siting of FRS resources to the needs of the local population, which was later accelerated by the need to accommodate the austerity cuts; the introduction of competency based training under the IPDS; a number of equality and diversity initiatives including recruitment, selection, and promotion; and the aborted introduction of Regional

Control Rooms that has been widely accepted as yet another failed government IT programme.

The FRS is one of the primary agencies that would attend and deal with man-made and natural disasters, not just on a local level but as part of a national response including terrorist threats and large-scale flooding. Reductions in FRS resources to meet reduced every-day needs would affect the ability to be prepared and to respond safely to these less frequent but resource intensive incidents and any future changes in demand. The effectiveness of the FRS and the safety of its operational staff may have been affected by the mass commitment of WB staff to the delivery of its community fire safety initiatives but as the opportunity arises to use this redundancy to improve and provide for the experience that has been lost over this period of time the FRS is facing pressure to reduce costs across the board resulting in the closure of stations, reductions in the appliance fleet, and of WT personnel. However, over-capacity (redundancy), and regular and improved realistic training are recognised as being requisites for High Reliability Organisations and cuts will affect the long-term ability to deliver an emergency FRS to meet the expectations of the local community. Using the example of the FRS modernisation programme itself, in project management there are three key elements consisting of resources, time and quality that need to be addressed and balanced. The time factor is upon the FRS now with the increased trend of firefighter deaths, and if the decision is to proceed with the cuts in FRS, then the quality of the service or the range of its services will need to be reduced but this will have to be in consultation with members of the community.

The management of FRSs may change in the near future with the local PCC taking on the role of leadership for FRSs. The concept of a single person being in charge has already been proved when the PCCs were first introduced and it would appear, based on a lack of media attention, the members of the public have not attributed any resulting degradation to police numbers or service delivery attributable to their PCC. The central government is also seeking to improve blue-light working between the emergency services and the introduction of an extended remit of the PCCs may be the way forward to achieving that aim.

At both national and local levels, concerns are still being raised regarding the quality and the value of the contribution being made by the elected members with only a minority of

the elected members appearing to contribute to the leadership of their FRS. In exercising this leadership role the FRAs, who are dependent on the professional advice of the POs, have overseen an increase in the attendance times before a fire appliance arrives at an incident, combined with a reduction in crewing levels. Increased attendance times means that fires will have continued to develop and escalate before the arrival of firefighters exposing them to more risk. Reduced crewing levels encourages, or forces, crews to undertake the necessary and immediate tasks without the appropriate resources which results in shortcuts in procedures being taken, which in turn impacts on firefighter safety. FRAs and their POs have defended these decisions and assured their communities that the FRS's service delivery meets the requirements of the FRA's Integrated Risk Management Plan for their community and mitigating the risks identified within the Community Risk Register but there is no recognition given to the likelihood of increased risks to WB staff. If additional resources are required and requested the initial crew is left exposed for a longer period of time awaiting the arrival of reinforcement crews who may be delayed because of the increase in attendance times. It may be appropriate to reduce crewing levels to the minimum if sufficient reinforcements are available in a timely manner when requested. If not then the local community's expectation of the FRS in what it can initially achieve when arriving at an incident might have to be better managed.

Sir Ken Knight, CFRA, envisaged a greater use of OC firefighters being made of by FRSs but one wonders if the historic and continuing difficulties in recruiting OC firefighters, and in retaining their services, were taken into consideration and whether OC can still be considered a robust system of firefighting provision. This has been a concern to FRS for many years to the point that discussions have been held on extending the call-out radius in which volunteers for OC must live. As a result this would increase attendance times yet again. It does put an onus on the community that if the FRA cannot pay for a WT service they may well have to ensure that as individuals they will support that service provision themselves. That may be by encouraging more community members to volunteer and become OC firefighters, and in taking a more proactive stance in regard to their own safe-keeping and that of their property and possessions.

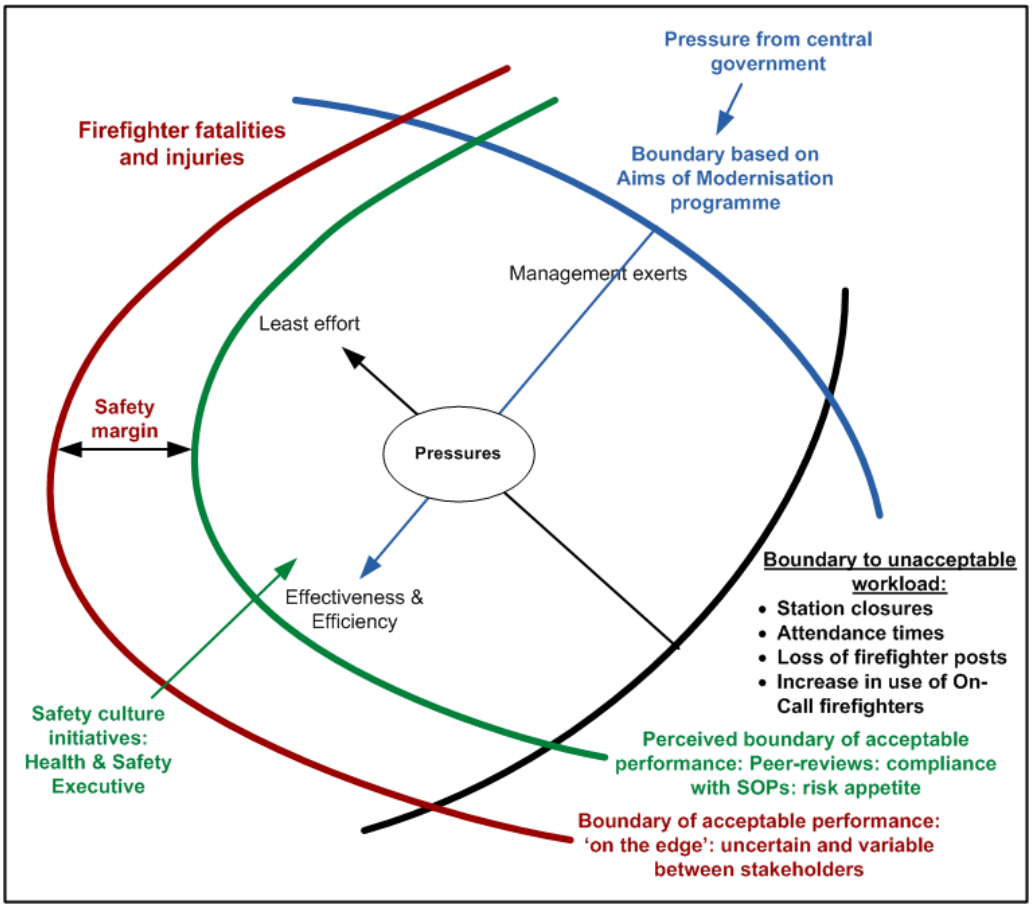
Are there differences remaining in the levels of competence between WT and OC firefighters? Bain et al. (2002) made the assumption that WT and OC firefighters were subject to the same amount of training per week. This was certainly not the case prior to

the introduction of the Integrated Personal Development System (IPDS) as for WT firefighters there would be a training period of at least one and a half hours on each shift over a tour of duty. Depending on the WM these drills might have been repetitive but they were regularly undertaken. Better WMs would vary those drills to include situational problems that firefighters had to resolve using just their appliances and the equipment they carried. If drills were continuously repetitive then perhaps this was more a reflection of the WM and a lack of imagination being applied. IPDS has changed this format now and drills and training requires only being sufficient to ensure individuals reach the point of being deemed competent. But as Reason (1997), Perrow (1999) and others point out training, and particularly in risk critical environments, needs to be constant to ensure those skills are available when staff are working under pressure. A number of the FRSs that Bain et al. visited during the course of their review would have already implemented the use of IPDS so in hindsight this assumption of Bain et al. of just one and half hours training per week may have been valid but he may well not have been aware of the results of research into training when he made his statement and recommendations. The principles of IPDS are valid but when the needs of the FRS management are factored in such as allowing them to demonstrate the competency of their operational staff to inspecting authorities the system has now become overly bureaucratic: it has become process rather than outcome focussed. POs and SOs that have been directly involved with the management of IPDS have spoken of the need to reduce the administrative burden by changing the focus from positive reporting to negative reporting. The latter would involve making the assumption that staff are competent and instead of having to enter details for everyone that completes a drill or carries out these actions on the incident ground they would enter just the details of those firefighters that needed additional training to reach competence. There needs to be a balance of basic drills and situational drills used in continuous training to ensure the competence of staff and to practice them in operating under stressful conditions.

This would be an appropriate point to use Rasmussen's 'drift into danger' model to emphasise the position the English FRS finds itself in at this time. Using Rasmussen's model (see Figure 7-1) we can see the effects of the pressure being exerted by management to meet central governments aims; the workload and its safety implications on WB staff from station closures, increases to attendance times, the loss of firefighter posts; and an increased use of OC firefighters. The Health and Safety Executive (HSE) has a view that is pushing the boundary of perceived acceptable performance further from the boundary of

acceptable performance and thereby increasing the safety margin. If the boundary of acceptable performance is exceeded then firefighter fatalities and injuries can be expected. However, this boundary is uncertain and difficult to define due to the variation in the risk attitudes of the key stakeholder groups. WB staff would like to operate more closely to the boundary of acceptable performance; many SOs would agree with this view but there are a substantial number that believe the safety margin should be maintained and continue to view standard operating procedures as having to be complied with. This view may be influenced by a lack of knowledge, trust, and confidence in WB staff and their own self-confidence in providing leadership in an operational environment that is full of uncertainties and risks. This is certainly a factor in some FRS managers at both WB and SO levels becoming more risk averse.

Figure 7-1. Using Rasmussen's model of drift into failure to highlight the position FRSs find themselves operating in.



This view may be influenced by a lack of knowledge, trust, and confidence in WB staff and their own self-confidence in providing leadership in an operational environment that is full of uncertainties and risks.

On-Call staff

Some FRSs have identified that with the increased amount of equipment, some of which is quite complex in its operation, OC firefighters do not have the time to achieve and maintain competency across the complete range of equipment that WT appliances carry. Their response has been to remove some of the equipment, the choice of which varies between these FRSs, but has included the removal of chemical protection suits, and line rescue equipment from OC appliances. This is contrary to Bain et al.'s (2002) expectations and potentially the inference of the CFRA who saw a greater role and contribution being made by OC firefighters in the future. There is an assumption being made by the researcher that the role of the FRS will remain the same in the future and that there will continue to be no distinction made between OC and WT firefighters. This will depend on future modelling of how best to provide firefighting services to the community. There is also an issue regarding senior officers employed on an OC contract in that if we accept that OC crews have difficulty in maintaining competence then the same question should be asked of these OC SOs with the increased demand on acquiring and maintaining an additional range of knowledge, skills, and understanding required for their role.

Station Managers

In reality the work of the Station Managers (SM) appears to be weighted on their managerial or administrative role contributing to the organisational bureaucracy with their operational commitment effectively taking second place. This is hardly surprising as the demand to attend incidents has been reduced in line with the overall reduction of calls and the majority of those calls do not require the attendance of a SM, and of those incidents they are mobilised to attend they are often not required. The opportunity to attend calls is not equally distributed between the officers due to where they live or where their primary place of duty is located. Therefore the exposure and the experience being gained by SM's in general is not only being reduced but is variable between individuals. If we accept what the majority of operational staff have indicated, that is the promotion system is producing managers rather than leaders, then the lack of having to apply themselves in their

operational role would reinforce the impression that their primary role is managerial. Yet which of their functions is more risk-laden and the consequences the most severe? Their operational role affects the safety of the community as well as ensuring the safety of WB staff. Although only one role higher than the WM the SM role is a more difficult role in that you are no longer part of a close-knit team; you may not even know the crews and suddenly that previous level of support you had previously known is gone.

Most WB personnel do not get to see their SM very often. It would seem that many have never attended a 'working job' and rarely an exercise with their SM so although they may have seen and even recognise their SM to talk to they have no appreciation how the SM performs on the incident ground. Is this individual competent? Is this officer experienced? Will this officer be able to quickly sum up the situation? Will they strictly enforce the SOPs or apply some operational discretion? Am I confident in their abilities and can I trust them? What is their credibility as a SO? These were the typical responses made by WB staff regarding officers they were unfamiliar with. Many WB staff would not be able to answer these questions from first-hand knowledge. Similarly, the SM will be asking these same type of questions of the WB staff. SOs will not always implement their preferred plan of action that may require the use of capable leaders and teams if the SO does not know those he or she is working with. This may require the plan to be simplified or totally changed, which may result in the loss of the advantages of the preferred plan. This is particularly relevant with basement fires and fires in high-rise buildings where the risks to WB staff are high and which encourages SOs to favour and adopt a defensive mode of firefighting. These issues are all of trust and confidence between the WB crews and the SOs that need to be addressed to create effective larger teams required to resolve the larger and more complex incidents.

Team working

The FRS prides itself on team working and it would be expected that at Watch level they are all familiar with each other. Whether they have practiced together sufficiently to become an effective team and aware of each other's strengths and weaknesses might be another matter, particularly in light of mixed crewing between WT and OC firefighters as adopted in some FRSs. IPDS views competence as being based on individuals and not teams. Aircraft accident investigations have previously identified that competent flight-crew members do

not automatically make effective teams without having trained together previously. Snook (2000) identified the issues associated with ad-hoc teams or pseudo-teams and FRSs must take this team approach into account and not focus on the cost factor and just ensuring the number of minimum riders is fulfilled for each appliance. Senior FRS management may have to relearn to factor in the need to not just ensure individuals are competent but that teams need to be effective and not a 'pseudo-team'.

Team working was a subject that SOs and POs are particularly interested in, in regard to their own operational role specific to two areas of incident command. The first is to do with the use of Incident Command Teams which has been attempted by some of FRSs before but again has been based on individual competences and establishing a temporary pseudo-team for each incident rather than working as an established team on a semi-permanent basis. Just being on the same officers' rota-group does not make effective teams by itself.

The second area that SOs would like to see change is the specialisation of incident command and in providing command support to the incident commander. The current theory in the FRS is that if you have passed the operational assessment for your 'rank' then you can be an operational incident commander and that it requires no specialism. All interviewees that spoke on this thought that it took extensive training and experience to be a good incident commander and that not everyone was suitable for the role. Some interviewees expressed a view that the operational assessments may not be testing the right characteristics based on some individuals being unable to replicate their results in successfully passing this assessment when they are mobilised as incident commanders. There are enough support functions at an incident that officers are required to undertake, often in areas of their own specialist function, other than incident command. With regard to incident command, officers would like specialist training provided to a number of SMs to act as the Command Support Officer to allow these officers to effectively undertake what might be considered to be the role of a systems manager, providing a link between the command support function and the incident commander. It is important that this officer has operational experience in this role as the individual would have to be able to filter information and to anticipate the Incident Commander's intentions at all levels. For similar reasons, crews of command support appliances should receive specialist training for their role. FRSs are increasingly turning to more complex and sophisticated systems for use on the command support appliances but little is being done to select the appropriate staff and

to provide the necessary training to crew members expected to use those systems, and the information they can access, to their full potential. These gaps between the information held by the FRS, being able to access it, and being able to use it, is a potential downfall that has been cited as a common contributory factor following previous inquiries into the actions of the FRS at incidents that resulted in firefighter injuries or fatalities.

7.1.1 Role of the Chief Fire Officers Association (CFOA)

The CFOA exercises a level of influence on the FRS that might be considered unhealthy and has been without challenge other than from the FBU. CFOA, or its officer members, provide the future direction of the FRS; the guidance for FRS activities; the management of those activities; they decide which activities will be reviewed and who will conduct those reviews from their membership; they review those activities; and they or their members will often decline to make the results of those reviews public. The CFOA was modelled and structured on the police equivalent, the Association of Chief Police Officers, which was subsequently found to be dominated by an inner core, that it did not represent all of policing, and that it was operating as a private company with no accountability to the public. This was found to be unacceptable, with questions raised regarding whether decisions were made in the best interests of the public or the ACPO's commercial arm. The ACPO has since been restructured to address those issues and has now evolved into the National Police Chiefs Council. These same concerns should be asked of CFOA and the extent and range of its influence reviewed by central government. This may well occur if the FRS is to join the police under the control of the Home Office.

7.1.2 Scrutiny

The performance of FRSs is being measured currently by the use of peer-reviews, which the CFRA has criticised in regard to its lack of independence and who reminds us that this is not scrutiny which would ensure the independence and objectivity of the findings. The FRS is expected to come under the jurisdiction of the Home Office, as are the police already and who retain their own Inspectorate, Her Majesty's Inspectorate of Constabulary (HMIC). It would be reasonable to assume that there will be some future establishment of a similar function for the FRS, or alternatively an expansion of the HMIC to provide a level of scrutiny and assurance to ministers on the performance of FRSs and their governance structure. The

FBU has already stated that it would support the reintroduction of HMFSI as has already occurred in Scotland.

One area that is likely to affect the safety of operational staff and their attitude towards safety is the proposed increase to the age of retirement. Not many male firefighters will be able to maintain the physical standards required to sixty years of age and one might argue that it would disproportionally affect some firefighters based on gender. To be able to reach retirement age a firefighter would have to become more risk averse and defensive in their firefighting tactics over the length of their career. At 'working jobs' the firefighter's work can be extremely physically demanding although exposure to severe fire conditions is becoming less common as the number, the size, and fire conditions are being reduced. Conversations and observation with WB staff indicate that firefighters rarely have to work in these extreme conditions and even then those directly exposed to these conditions are relatively small in number; not every firefighter that attended will be exposed. However, to expect firefighters to work in these conditions if called upon up to the age of sixty would require a re-think of the role of FRSs to ensure the safety of firefighters; both the older firefighters, and the younger firefighters who might be dependent on their older colleagues at an incident.

7.1.3 Leadership versus management

The selection process for promotion forms part of the IPDS but the majority of operational staff believe that the system is conditioned to develop and produce managers that are more at ease in complying with procedures, to the disadvantage of leaders that are more prepared to take into account the situation and to make the difficult decisions on the incident ground. Managers are more willing to comply with their organisation's SOPs even in circumstances that suggest they do not fit the situation and they will be more risk averse in their managerial approach. Leaders are more likely to view SOPs as guidance and adapt them to the situation. The FRS has had difficulty in coming to terms, at least publically, that there is a difference between managers and leaders. Privately, POs will admit there is a continuing issue regarding the selection of the right individuals. The IPDS promotion system is based on the candidate's report of their own competence and performance and a series of assessments but there is a lack of input from the line manager, who, one would like to think, knows the candidate the best in their working environment and works with them

every shift. One needs to remember that the original design of the IPDS was intended to remove subjectivity, or more specifically nepotism, from the process.

With their administrative role taking up most of the SOs available time than that of their operational role, compounded by what appears to be a promotion system that is thought to favour managers to the disadvantage of leaders, it reinforces the impression that managers are preferred to leaders within the FRS. The promotion system needs be reviewed to address some of these issues that FRS staff have identified themselves. This would require a change in emphasis from a focus on the elements the candidate included in their self-assessment and which they would like to be judged on, and instead adopt a more inclusive approach, including the line manager's recommendation. These recommendations should be given a greater weighting in the process than that of the candidate's own assessment of him or herself. It cannot be a robust assessment to base a decision on the one occasion a candidate fulfilled their role competently yet ignore all the previous attempts at which the candidate failed. As one PO stated good managers do not necessarily make good leaders so if the role of the FRS is to retain an offensive firefighting capability they need to revise how they assess the operational capabilities of candidates.

7.1.4 Operational training

Training needs to be a constant part of the routines of both WB staff and SOs to ensure they are properly prepared to undertake their operational roles. Instead of training and assessments being based on compliance with SOPs, training should reflect the realities of the situation found on the incident ground and incorporate a level of operational discretion in which SOPs are considered as providing guidance. This would need to incorporate effective decision making of the incident and supporting commanders, which the Decision Making Model (DMM) can prepare operational staff of all ranks for, both in the training environment and operationally. SOs need to be able to, and should spend more time training with their staff, as well as attending incidents with them, so as to be able to make valid judgements on those whom they exercise authority over and for both the leaders and their crews to gain trust and confidence in each other. Currently, there is very little training undertaken that involves SOs and the crews they are likely to have to work with and are having to resort to limiting their judgements based on individual's being assumed to be

competent with no regard to the emergent properties associated with individuals working as teams.

7.1.5 Audit and assurance

An operational internal audit function providing operational assurance to the POs and the FRA on operational effectiveness and efficiency, and the safety of operational staff may initially appear to be an expensive asset for a FRS to provide especially as injuries to operational staff are fairly infrequent, and fatalities are relatively rare, so there may not be a tangible demand for such a function. However, the assurance function can proactively identify the latent conditions affecting firefighter safety that may be hidden or unrecognised to allow action to be taken before an untoward accident occurs. The assurance function also provides the resource for "mindful leaders *(to)* appoint others to be their eyes and ears and go out and investigate, bringing to bear the same unease that they feel themselves" (Hopkins, 2008).

The need to make savings to meet the demands of austerity has acted as the driver to review the requirement of these assurance functions and either to do away with the function, or to effectively downgrade it. The low level of probability of occurrence of such events as injuries to WB staff or potentially fatalities may appear to be a reasonable rationale behind the decision, but bear in mind it is not the FRA or the POs that face the consequences; it is the WB staff (physical risk), incident commanders (legal risk), and the taxpayers (financial risk), that carry the risk; the outcomes of previous court cases indicate that the decision-makers at FRA and FRS level would appear to remain unaccountable for their previous decisions or lack of action. Many FRSs have downgraded their assurance function, or instead have utilised the Monitoring Officers (MO) for this role, which is not a robust system as it introduces the possibility of biased, inconsistent and inaccurate reporting. As a result there is a lack of information reaching the executive and board levels of the FRS and FRA respectively and there is a question regards the variability of what information is made available.

To improve the cost-benefit ratio of their assurance function, some FRSs have utilised the skills of the assurance team members to include the investigation of serious accidents and near misses, and to be responsible for the FRS's risk management, which the Institution of

Internal Auditors (IIA) recognises causes no conflict of interest for smaller organisations. The issue is to ensure that the staff providing the assurance function receive the appropriate training for the role and that they have a direct line to the Chief Fire Officer (CFO) so that their reports cannot be influenced by others with vested interests. As two CFOs have previously said to the researcher, they looked at their FRS assurance function as making sure they didn't go to jail. The assurance function, if effective, can provide a positive bridge with external auditors which can then reduce the burden of inspection on the organisation, which is again a benefit recognised by the IIA.

At the level of SOs and POs there was a tendency to view the peer-to-peer reviews as being ineffective which is certainly the view of Sir Ken Knight, whose role is to advise central Government on FRS matters. The re-introduction of an independent and objective audit function should be a priority for central government.

7.1.6 Planning for the next major exit of experienced staff

The English FRS has experienced at least two occasions when a significant number of its operational staff left on retirement after thirty years of service in a very short period of time. These were associated with the mass intake of firefighters in 1974 and 1977, following periods of industrial action over pay and working conditions. This is likely to be repeated in the future and until as such time that FRAs can better manage the pace of recruitment and retirement in the form of succession planning. With these retirements the FRS has lost considerable years of experience that cannot be replaced with current training regimes. Some SOs, particularly those who have worked in their FRS training function, and some POs believe that this loss of experience has led to the FRS becoming more risk averse.

7.1.7 Risk and rewards

POs receive substantial salaries and bonuses yet carry no apparent personal risk, physical or legal, to themselves from their role in managing their FRS. The size of these salaries seem to bear little relationship to the size of the budget, the number of resources, and the size of the staff they manage, nor are they easily compared with their own peer-group across FRSs. This was an issue that was raised by a number of WB staff, and some SOs, and is one that is noticeably creating a divide within the FRS and a feeling that POs no longer have the interests of the FRS at heart, but are focussed on their own interests, that is, increasing

their own benefits and conditions of service. This division also reflects two main categories of employees within the FRS; those with membership of CFOA and the FBU members. This lack of equitable distribution of risk and rewards should be looked at if only to see how the potential for future friction can be reduced and to focus on the organisational needs of their FRS and the safety of their staff in regard to the number of riders on appliances, and the attendance times of supporting appliances required to implement FRS safe working policies, that is their operational procedures.

7.2 Procedures

The number of SOPs each FRS has introduced are far too many for operational staff to be able to recall in detail at incidents, especially when under pressure, and particularly when they are being amended or updated at regular intervals. There is a sizeable burden for some FRSs in ensuring their SOPs are kept up to date which is sometimes compounded due to the interconnections between them. Many are written in different formats and, although available on their Mobile Data System on appliances, it is not always easy to locate the part of the SOP they need to refer to in what are often multiple-page documents. WB staff do not get to practice SOPs very often due to the number of staff required to implement a procedure correctly, or the lack of availability of specialist equipment. There is also a need to find and devote extensive time over many days to cover the SOP both theoretically in the station's lecture room, in the station's drill yard, before proceeding to conduct an exercise on-site at premises at which these SOPs would be required to be used. Not all the personnel will receive the required training due to sickness, leave, attendance on courses, and the need to standby at other stations to cover a shortfall in their crewing levels. SMs are rarely involved in the planning and delivery of the training at the stations they are responsible for. We then come back to whether SOPs are there for compliance or guidance and what operational discretion is allowed, if any, in how they are implemented within individual FRSs.

SOPs tend to be written locally by each FRS. Generic Risk Assessments are a series of national documents, but SOPs provide a local interpretation and relate to the resources available within that FRS. Some procedures will include reference to agreed inter-agency policies that may be very different between FRSs. It is this localism that affects the cross-border operations between FRSs and their effectiveness. This current situation will not

change until central government steps in, or it encourages CFOA to address the situation so that SOPs become a national standard. One FRS that the researcher is aware of would automatically mobilise a SO to accompany any of its appliances that were sent across their FRS border to assist another FRS at an incident, so as to ensure both crews and equipment were utilised in a controlled manner, within their competences, and in accordance with their own FRS's SOPs to which they had trained.

An incident commander has to use informed decision-making at all times but particularly when there are conflicts between SOPs, or the situation does not reflect that as it is written in the SOP. For a number of years the Fire Service College (FSC) has been teaching the Decision Making Model (DMM) incorrectly and a second decision making model designed to address the perceived issues with DMM was recently introduced. The consultation phase highlighted the previous understanding held by the FSC of the DMM was incorrect. As a result this later model is now being used to highlight the effect of decision traps on decision making. However, there remains the need for CFOA to clarify the status of the DMM and whether it can still be used by practitioners and what is the role of the latter model, the DCP, which was described by the FRS officer introducing it as bridging the gap between the FRS and academia.

7.3 Work pressure

The focus on Community Fire Safety (CFS) and the introduction of the Home Fire Risk Check (HFRC) programme, which included the installation of domestic smoke alarms, was resource intensive with the WB staff, predominantly WT staff, undertaking the workload. That programme workload has started to reduce and more time has started to become available for other uses. Considering the 80/20 rule where 20% are the cause of your issues the HFRC only reached 80% of the FRS communities and that additional CFS initiatives will be required to reach the remaining 20%. With the co-operation of additional stakeholder groups the FRS will not have to carry the future burden of the implementation of community safety initiatives alone.

Over the period of FRS modernisation, including the HFRC programme, the introduction of the IPDS, and FRS changes to governance, both the number of fire deaths within local communities, and the number of emergency calls have been reduced. Over this same time

period the FRS has lost considerable numbers of WT experienced firefighters to retirement who have either not been replaced, or have been replaced by OC firefighters. The outcome is that there are fewer members of staff to undertake these community safety initiatives that have been prioritised over the training needs of firefighters.

7.4 Reflection on the use of research methods

This research has been primarily focussed on the WT members of the FRS consisting of WB staff, SOs and POs, but does include a small number of staff on OC contracts. The researcher's original intention had been that they would be included, using stratified sampling, in equal numbers in relation to their ratio with WT staff. This did not happen for a number of reasons despite the efforts of the researcher, and the best efforts of the nominated FRS liaison officers. The main difficulty was in gaining access to the OC staff who only attend their stations on their drill night for a period of between two to three hours, dependent on the FRS, and at those times when they are mobilised to attend an incident. It was agreed with the liaison officers that it would be too intrusive on their work programme if the researcher was to visit these stations on the drill nights and there was also a time and resources factor to be considered regarding travelling between stations in an area far from the researcher's main place of residence. The researcher had enquired whether the questionnaires could be posted to the OC members' home address but the argument against this was that it could cause an issue to be raised via their line managers or with their representative body. What was agreed between the liaison officers and the researcher was that questionnaires would be left with self-addressed envelopes for each of the OC staff, which would be distributed by the officers, either WT or OC, responsible for each station. The number of returned questionnaires from the OC staff was lower than expected and appeared to be dependent on the efforts of other FRS officers who were in effect gatekeepers to this element of the FRS staff. In hindsight, it would require a more personalised approach to the 'gatekeepers' to achieve their assistance in making the use of a questionnaire aimed at OC staff successful. To access the OC staff it would require a larger team of researchers and would be easier if the focus for research was restricted to a single FRS. The OC respondents were included in a single group with WT respondents. Analysis of the data between OC and WT respondents showed that in general the responses between the two groups were similar with the main difference being the strength of attitude with

the WT respondents tending to express a stronger attitude to the statements than the OC respondents.

The researcher could have just as easily have chosen to use a deductive instead of the selected inductive research strategy. A deductive strategy could have been adopted by establishing a number of working hypotheses using the researcher's own experiences in the FRS. The decision was taken to adopt an inductive strategy, using a mixed research methodology of both quantitative and qualitative methods. This allowed the researcher to look at both the safety climate and the safety culture in the FRSs. As part of the research process a questionnaire specific to the FRS operational personnel was developed as the opinion of FRS staff, who trialled the Health and Safety Laboratories safety culture questionnaire, felt the question set did not relate well to the issues they believed were affecting safety in the FRS and that they thought should be asked. The resulting survey tool, the safety culture questionnaire, received good feedback from those in the target population that completed it and has been included in Appendix 6-2. The major downside to having adopted this research methodology has been the time and resources it has taken to complete the research.

7.5 The relationship between culture and climate, risk and safety in the blue-light services.

This research seeks to contribute to the body of academic knowledge by extending how previous academic research on culture, climate, the concepts of safety and risk, and our perceptions of an organisation are interconnected with one another. It looks at how in the real world, the synergy, or the realisation of the emergent properties from the sum of the parts of previous research, might be used to better understand the decisions and the resulting actions that occur during incidents, or events; that are temporal by their very nature; dependent on the situation; with high levels of uncertainty; with constraints on time in which to make decisions and to take the appropriate actions. All of these issues are pertinent to the work of firefighters and incident commanders on the incident ground and have been found to be the cause of previous misunderstandings between the FRS and the HSE whose focus has previously concentrated on safety culture alone.

Previous academic research has been incorporated into a model (see Figure 2-9) that provides clarity of how they are interconnected, and how we should view different

organisations, or their constituent parts, that provide the delivery of their front line service. The findings of this thesis identify the key issues around management, procedures, competence, and work pressure that operational staff currently believe affects their safety on the incident ground and the effectiveness of the safety culture of their FRS.

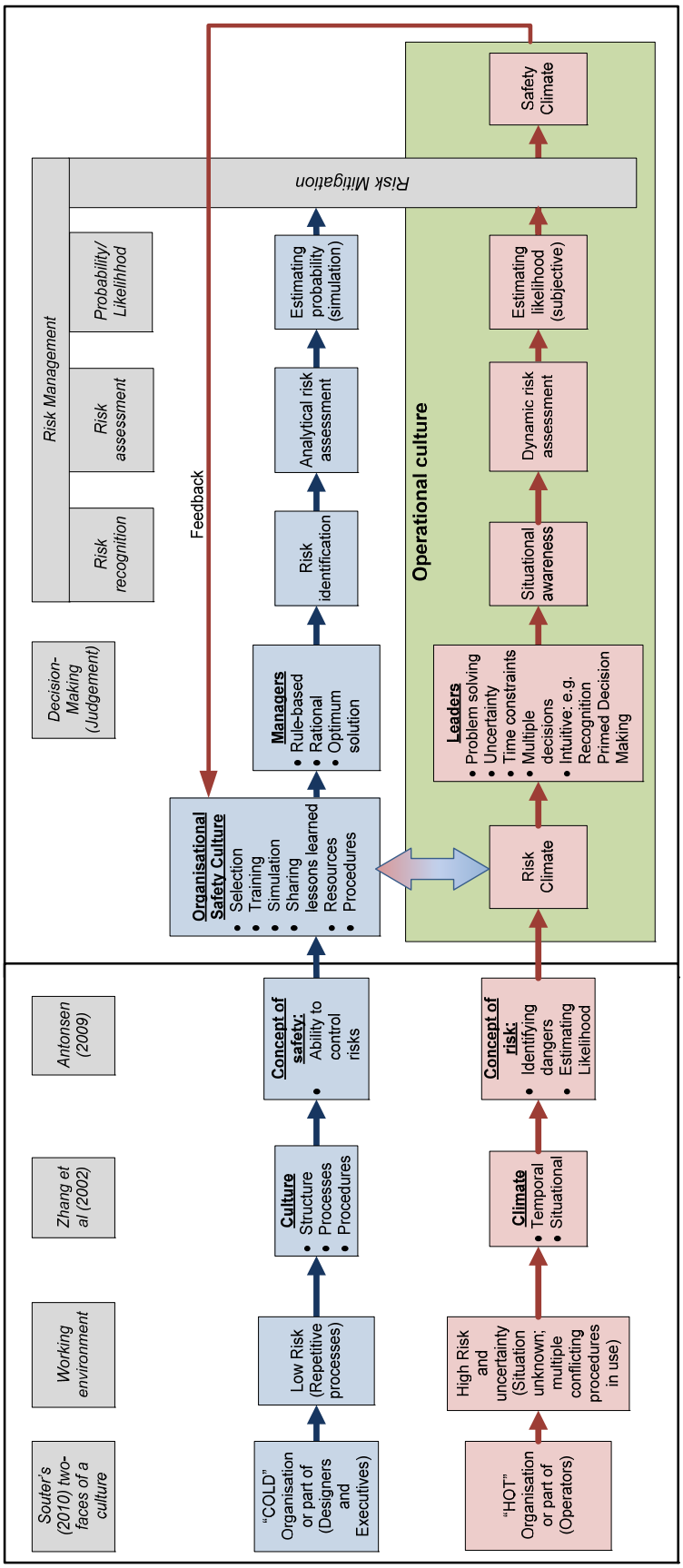
This research incorporates Soeter's (2010) concept that certain organisations, or parts of an organisation, because of the nature of their work, can be considered to have a 'cold' and a 'hot' side to its activities based on the working environment they operate in. It is the working environment that determines whether the staff are working within a long and well-established organisational culture, or a climate based on the temporary nature of the working environment; a concept we are introduced to by Zhang et al (2002). Antonsen (2009) informs us that the two working environments are subject to two further concepts. The 'cold' side of an organisation that has developed over time will have established its own organisational *culture*, which will operate subject to the concept of *safety*, reflecting its stable working environment in which very little uncertainty remains and the organisation's level of risk tolerance. Antonsen's second concept focuses on what is effectively the 'hot' side of an organisation, in which it will adopt a *climate* based on the temporal nature of the specific circumstances of an incident or event, using the concept of *risk* to reflect the high levels of uncertainty in its working environment and at incidents attended by the FRS, the level of incident commander's risk appetite. From this we can view the English FRS, when it is working within its headquarters, its training facilities and at the fire stations, as being part of the FRS's 'cold' side reflecting the safety culture of that particular FRS. Operationally, where incidents can be considered as temporary events, each differentiated by the circumstances in which the incident is situated, that operational staff will be operating within a risk climate. This is all brought together in Figure 7-2 which was developed, after a period of reflection, using the model shown in Figure 2-9. The first part of the model, shown in the left-hand box is that of the initial model from Figure 2-9 based on the results of the literature review.

The second box is based on the results of the fieldwork conducted for this research. In this second box we can see the FRS safety culture based on the 'cold' side of the FRS and how it influences the selection of staff, their training including simulations, the resources made available, the adopted procedures, and how lessons learned from previous incidents are shared and used to promote safety within the organisation. These are all processes that are

the responsibility of managers and when decisions have to be made they are done so by using rule-based policies and procedures, selecting the optimum solution resulting in the making of rational decisions. This forms part of the manager's day-to-day functions, or as part of project-based work they may be involved with. With regard to risk management in their decision-making, the model shows four generic phases. The first is risk recognition, followed by risk assessment, then determining the probability or likelihood of a risk occurring, and finally, to implement the relevant risk strategies to mitigate the risk. For the manager this entails identifying the risks, conducting an analytical risk assessment, and then objectively estimating the probability of it occurring, possibly by using simulation software. Specialist advice in conducting the analytical risk assessment and the probabilities of an event occurring may be available within the FRS or, more likely, it will have to be bought in from external sources.

This contrasts with incident commanders, operating on the 'hot' side of the FRS who may find themselves with a situation that is rapidly deteriorating and in which the reality of the situation is not readily identifiable. It is this risk-laden environment with high-levels of uncertainty that the researcher identifies as being the risk climate. The risk climate is affected by the safety culture of the FRS with regard to previous training, and the provision of resources and the development of operational procedures. In these circumstances the incident commander will have constructed his or her situational awareness which they can do by using the Decision Making Model shown in Figure 4-6. The first three boxes of this decision-making model include building the mental picture of the situation from the different available sources; identifying what resources are available on-site, within the FRS or other agencies; and identifying what the range of risks are that crews are being presented with. This last task is completed by conducting a Dynamic Risk Assessment in which estimates of the likelihood of a risk materialising are made subjectively as part of an intuitive decision-making process used to meet time constraints imposed by the situation, to take advantage of potential windows of opportunity. This is more often than not conducted by the use of the Recognition-Primed Decision-Making model. From this process the incident commander will determine the appropriate risk controls to be implemented in conducting operations which would include the level of supervision being applied to firefighters.

Figure 7-2. Relationship between culture and climate, risk and safety in blue-light services.



This level of supervision can be difficult to implement as WB staff and many SOs recognise that many supervisory officers are often detached from their crews to operate in a specialist role at an incident. This leaves the crews under the control of a firefighter who may not have undertaken the operational training and passed the operational assessment for that role. The overall aim is to transform the situation from being one that can be described as being a risk climate that is focussed on the risks and risk identification, to that of being a safety climate in which temporary structures and processes are put in place to deal with the situation in a relatively safe manner. Risks are subject to temporary controls to mitigate the likelihood and the consequences of them occurring. Following an incident it is expected that the incident commander will conduct a debrief that may entail gathering crews together before they leave the scene of a relatively small incident to review FRS actions and how they might perform better at a similar incident in the future; this is commonly referred to as a 'hot debrief'. At more complex incidents a more formal debrief is conducted at a later date at a FRS location. The results of these debriefs are then used, as part of a formal feedback loop, to inform the FRS of the strengths and weaknesses so as to improve areas such as FRS training, the applicability of operational procedures, and the lessons to be learned from that incident. It is this temporary situation of the risk-laden, risk climate and the objective of moving to a safety climate in which safe systems of work and temporary structures are adopted that the researcher has defined as being representative of the FRS's operational culture. This researcher would define operational culture, in the context of the English FRS, in the following terms:

> The FRS operational culture determines the actions that the FRS will undertake to resolve an operational incident at which its staff and resources are in attendance. It is influenced by the FRS's safety culture based on analytical risk assessments, national and local FRS guidance documents, and the FRS's level of risk tolerance as defined within the Dynamic Risk Assessment. At the scene of the incident the operational culture incorporates the risk climate and the level of risk appetite, set by the incident commander, to reflect the uncertainties, the dynamic nature of an incident, and the time constraints under which they may be operating. Once effective risk strategies are in place the incident will gradually move to be operating in a safety climate in which to bring about a successful conclusion to an incident.

The use of the model is not restricted to just the English FRS as it can just as easily be used with other UK FRSs, blue-light emergency services, the National Health Service, the armed forces, and any organisation that has members of its workforce working externally from its own structure and immediate control, in a hostile working environment that may require:

independent decisions to be made in a timely manner, in dynamic environments, with high levels of uncertainty and risk, without being able to refer to higher levels of management. This model will also provide a better understanding for the HSE as to how these organisations operate in reality and to inform their future accident investigations, or inspections, to include the risk and safety climates of the FRS that they are likely to be called upon to undertake in the future.

7.6 Future research

As in all research there is never enough time or resources to include all the related or associated issues the researcher would like to. The following issue arose during the course of the research but was excluded by the researcher because of the constraints of this research into the FRS.

Effect of gender and race on risk appetite/aversion

The impact of gender and race regarding differences in risk appetite, or risk aversion, in firefighting staff: There has been research conducted in the USA that suggests both gender and race will affect risk taking behaviour. The modernisation of the English FRS included a focus on equality and diversity including greater recruitment from women and those from the minority ethnic groups. Future research might include investigating whether the national and local policies associated with FRS equality and diversity initiatives have affected the risk-taking behaviour of operational staff.

References

ADAIR, J. 1988. *The Action-Centred Leader,* London, The Industrial Society.

ALVESSON, M. 1993. *Cultural perspectives on organisations,* Cambridge, UK, Cambridge University Press.

ALVESSON, M. 2013. *Understanding Organizational Cutlure, 2 ed.,* London, Sage.

ANTONSEN, S. 2009a. The relationship between culture and safety on offshore supply vessels. *Safety Science,* 47: 8, 1118-1128.

ANTONSEN, S. 2009b. Safety culture and the issue of power. *Safety Science,* 47: 2, 183-191.

ANTONSEN, S. 2009c. *Safety Culture: Theory, Method and Improvement,* Farnham, Ashgate.

ARBUTHNOT, K., 2011 *Personal conversation on the Decision Making Model* with WOOD, G. on 19/1/2011 at at the Institution of Fire Engineers, North East (Number 4) Branch, Leicester

ARGYRIS, C. & SCHON, D. A. 1974. *Theory in practice: increasing professional effectiveness,* San Francisco, CA, Jossey-Bass.

ARGYRIS, C. & SCHON, D. A. 1978. *Organisational learning,* Reading, MA, Addison-Wesley.

ARGYRIS, C. & SCHON, D. A. 1996. *Organizational Learning II,* Reading, MA, Addison-Wesley.

ASHBY, S., PALERMO, T. & POWER, M. 2012. *Risk culture in financial organisations: an interim report,* Centre for analysis of risk and regulation.

AUDIT COMMISSION 2008. *Rising to the challenge: Improving fire service efficiency,* Audit Commission,.

AUDIT COMMISSION 2009. *Comprehensive Area Assessment: Fire and rescue service,* Audit Commission.

AUDIT COMMISSION 2013. *Comprehensive Area Assessment: Framework document,* Audit Commission.

BACHMAN, E. G. 2009. Situational Awareness: The First Line of Defense. *Fire Engineering,* November 61-66.

BAIGENT, D. 2001. *One more last working class hero: a cultural audit of the UK fire service.* PhD.

BAIN, G., LYONS, M. & YOUNG, A. 2002. *The Future of the Fire Service: reducing risk, saving lives: The Independent Review of the Fire Service*.

BAINBRIDGE, L. 1987. Ironies of automation. *In:* RASMUSSEN, J., DUNCAN, K. & LEPLAT, J. (eds.) *New Technology and Human Error.* Chichester: Wiley.

BANDURA, A. 1977. Self-efficacy: toward a unifying theory of behavioral change. *Psychological Review,* 84 191-215.

BANDURA, A. 1986. *Social Foundations of Thought and Action: A Social Cognitive Theory,* Engelwood Cliffs, NJ, Prentice-Hall.

BANKS, E. 2012. *Risk Culture: a Practical Guide to Building and Strengthening the Fabric of Risk Management,* Basingstoke, UK, Palgrave Macmillan.

BARLEY, S. 1983. Semiotics and the study of occupational and organizational cultures. *Administrative Science Quarterly,* 28 393-414.

BBC NEWS. 2002. *Family fails to prosecute fire service* [Online]. BBC News. Available: http://news.bbc.co.uk/2/hi/uk_news/england/2585941.stm [Accessed: 19 April 2015].

BBC NEWS. 2012. *Man drowned feeding swans on lake after epileptic seizure* [Online]. BBC. Available: http://www.bbc.co.uk/news/uk-england-hampshire-17131333 [Accessed: 20 April 2014].

BLAIKIE, N. 1993. *Approaches to Social Enquiry.,* Cambridge, MA, Polity Press.

BLAIKIE, N. 2009. *Designing Social Research, 2nd ed.,* Cambridge, Polity Press.

BLOMQVIST, K. 2002. *Partnering in the Dynamic Environment: the Role of Trust in a Symmetric Technology Partnership Formation.* PhD, Acta Universitatis Lappeenrantaensis.

BOGNÁR, A., BARACH, P., HJOHNSON, J. K., DUNCAN, R. C., BIRNBACH, D., WOODS, D., HOLL, J. L. & BACHA, E. A. 2008. Errors and the Burden of Errors: Attitudes, Perceptions, and the Culture of Safety in Pediatric Cardiac Surgical Teams. *The Annals of Thoracic Surgery,* 85: 4, 1374-1381.

BOLON, D. S. & BOLON, D. S. 1994. A Reconceptualisation and Analysis of Organisational Culture: the Influence of Groups and Their Ideocultures. *Journal of Managerial Psychology,* 9: 5, 22-27.

BOZEMAN, B. & KINGSLEY, G. 1998. Risk Culture in Public and Private Organizations. *Public Administration Review,* 58: 2, 109-118.

BROMLEY, D. B. 1986. *The case-study method in psychology and related disciplines,* Chichester, England, Wiley.

BRYMAN, A. & CRAMER, D. 1997. *Quantitative Data Analysis with SPSS for Windows: a guide for social scientists,* London, Routledge.

BURKE, E. 1997. Competence in command: recent R&D in the London Fire Brigade. *Journal of Managerial Psychology,* 12: 4, 261-279.

BURKE, E. 2014. *Use of the Fire Decision Model in contrast the the use of the Decision Making Model.* from BURKE, E. to WOOD.G.

BURRELL, G. & MORGAN, G. 1979. *Sociological Paradigms and Organization Analysis,* London, Heinemann.

BUSCHE, G. R. 2009. *Clear leadership, Rev. ed.,* Mountain View, CA, Davis-Black.

BUTLER, T. P. & WHITTY, M. J. 1991. *Management Report: 20 Pump Fire (FATAL)-10th July 1991: Hays Business Services Ltd, Gillender St. E3.,* London Fire Brigade.

CANNON-BOWERS, J. A. & SALAS, E. (eds.) 1998. *Making decisions under stress: Implications for individual and team training,* Washington, USA: American Psychological Association.

CATHERWOOD, D., SALLIS, G. & MEDLEY, A. 2011. Scoping and Bias in the Fireground: A new approach to understanding fireground "situation awareness". *Fire.*

CHAMBERLIN, P. Portals, April. Eigth International Wildland Fire Safety Summit: Human factors - 10 years later, 2005 Missoula, MT. U.S.A.

CHARTER, M. 2009. *The Impact of Communications on the Spokane Valley Fire Department Safety Culture.*

CHIEF FIRE OFFICERS ASSOCIATION. 2010. *CFOA Position Statement - Integrated Personal Development System* [Online]. CFOA. Available: http://www.cfoa.org.uk/10045 [Accessed: 15 January 2016].

CHIEF FIRE OFFICERS ASSOCIATION. 2015a. *National Operational Guidance Programme: Incident Command* [Online]. CFOA. Available: https://fireandrescue-public.sharepoint.com/Pages/Guidance-Catalogue.aspx?guidanceid=140 [Accessed: 25 February 2016].

CHIEF FIRE OFFICERS ASSOCIATION 2015b. *National Operational Guidance Programme: The Foundation for Incident Command, 1 ed.*, CFOA.

CHOUDHRY, R. M., FANG, D. & MOHAMED, S. 2007. The nature of safety culture: A survey of the state-of-the-art. *Safety Science,* 45: 10, 993-1012.

COHEN-HATTON, S. The Psychology of Incident Command. Institution of Fire Engineers (Scottish Branch), 4 June 2014 Strathclyde Fire and Rescue Service, Cambuslang Training Centre.

COHEN, A. 1977. Factors in successful occupational safety programs. *Journal of Safety Research,* 6 168-178.

COLLYER, S. C. & MALECKI, G. S. 1998. Tactical Decision Making Under Stress: History and Overview. *In:* CANNON-BOWERS, J. A. & SALAS, E. (eds.) *Making Decisions Under Stress: Implications for Individual and Team Training.* Washington DC: American Psychological Association.

COLUMBIA ACCIDENT INVESTIGATION BOARD 2003. *Columbia Accident Investigation Board Report, Vol. I,* Columbia Accident Investigation Board.

COMMUNITIES AND LOCAL GOVERNMENT 2009. *Occupational health, safety and welfare: Guidance for Fire and Rescue Services: Generic Risk Assessments: Introduction,* CLG.

COMMUNITIES AND LOCAL GOVERNMENT 2012. Fire and rescue national framework for England. London: DCLG.

COMMUNITIES AND LOCAL GOVERNMENT 2013. *Fire and Rescue Authorities: Health, safety and welfare framework for the operational environment,* Department for Communities and Local Government,.

COMMUNITIES AND LOCAL GOVERNMENT. 2015. *Fire and Rescue: Operational Statistics Bulletin for England: 2014-15* [Online]. Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/462817/Operational_Statistics_2014-15_statistical_release.pdf [Accessed: 19 November 2015].

CONNOR, P. E. & BECKER, B. W. 1994. Personal values and management: What do we know and why don't we know more? *Journal of Management Inquiry,* Three 67-73.

COOLICAN, H. 2004. *Research Methods and Statistics in Psychology, 4 ed.,* Abingdon, Hodder and Staunton.

COOPER, M. D. 2000. Towards a model of safety culture. *Safety Science,* 36: 2, 111-136.

COX, S. & FLIN, R. 1998. Safety culture. *Work & Stress,* 12: 3, 187-188.

CRESWELL, J. W. 2003. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches., 2 ed.,* London, Sage.

CROTTY, M. 1998. *The Foundations of Social Research: Meaning and Perspective in the Research Process.,* London, Sage.

CYERT, R. M. & MARCH, J. G. 1963. *A Behavioural Theory of the Firm,* Englewood Cliffs, NJ, Prentice-Hall.

DALTON, M. 1959. *Men Who Manage,* New York, NY, Wiley.

DARK, A. 2011a. An appeal for professional standards. *Firefighter*: November/December, 16-17.

DARK, A. 2011b. *Correspondence highlighting concerns of the Fire Brigades Union regarding public and firefighter safety.* from DARK, A. to SIR KEN KNIGHT CFRA, 6 October 2011.

DEKKER, S. 2005a. *Ten Questions About Human Error: A New View of Human Factors and System Safety,* London, Lawrence Erlbaum Associates.

DEKKER, S. 2005b. *Why we need new accident models,* [Lund University School of Aviation Technical Report 2005-02].

DEKKER, S. 2006. *The Field Guide to Understanding Human Error,* Farnham, Ashgate.

DEKKER, S. 2007. *Just Culture: Balancing Safety and Accountability,* Farnham, Ashgate.

DEKKER, S. 2011a. The criminalization of human error in aviation and health care: a review. *Safety Science,* 49 121-127.

DEKKER, S. 2011b. *Drift into Failure: From Hunting Broken Components to Understanding Complex Systems,* Farnham, Ashgate.

DEKKER, S. 2012. *Just Culture: Balancing Safety and Accountability, 2nd ed.,* Farnham, Ashgate.

DENISON, D. R. 1990. *Corporate culture and organizational effectiveness,* New York, Wiley.

DENISON, D. R. 1996. What is the Difference between Organizational Culture and Organizational Climate?: A native's point of view on a decade of paradigm wars. *Academy of Management Science,* 21: 3, 619-654.

DENZIN, N. K. & LINCOLN, Y. S. 1998. *Strategies of Qualitative Inquiry.,* London, Sage.

DEPOY, E. & GITLIN, L. N. 1998. *Introduction to Research: Understanding and Applying Multiple Strategies.,* London, Mosby.

DIEHL, D. N. 2008. Improving Situational Awareness in a Fire Structure. *Fire Engineering,* April 24-28.

DIMAGGIO, P. 1997. Culture and cognition. *Annual Review of Sociology,* 23 263-287.

DISMUKES, R. K., BERMAN, B. A. & LOUKOPOULOS, L., D. 2007. *The limits of Expertise: Rethinking Pilot Error and the Causes of Airline Accidents,* Aldershot, Ashgate.

DONMEYER, R. 1990. Generalizability and the single-case study. *In:* EISNER, E. W. & PESHKIN, A. (eds.) *Qualitative Inquiry in education: The continuing debate.* 175-200, New York: Teachers College Press.

DOUGLAS, M. 1985. *Risk: Acceptability According to the Social Sciences,* London, Routledge and Keegan Paul Ltd.

DOUGLAS, M. 1986. *How institutions think,* Syracuse, NJ, Syracuse University Press.

DOUGLAS, M. 1992. *Risk and Blame: Essays in Cultural Theory,* London, Routledge.

DOWIE, J. & ELSTEIN, A. (eds.) 1988. *Professional Judgement: A reader in clinical decision making,* Cambridhe: Cambridge University Press.

EAST SUSSEX FIRE AND RESCUE SERVICE nd. *The Marlie Farm Explosion: Significant Findings of the Investigation into the Fire and Fatal Explosion December 2006,* East Sussex Fire and Rescue Service.

ECKSTEIN, H. 1975. Case study and theory in political science. *In:* GREENSTEIN, F. E. & POLSBY, N. (eds.) *Handbook of Political Science.* 79-137, Reading, MA: Addison-Wesley.

ECKSTEIN, H. 1992. *Regarding Politics: Essays on Political Theory, Stability and Change,* Berkeley, CA, University of California Press.

EDWARDS, J. R. D., DAVEY, J. D. & ARMSTRONG, K. 2013. Returning to the roots of culture: A review and re-conceptualisation of safety culture. *Safety Science,* 55 70-80.

EKVALL, G. 1983. *Climate, Structure and Innovativeness of Organisations. Working paper of The Swedish Council for Management and Organisational Behaviour*.

FENDER, D. L. 2003. Controlling risk taking among firefighters. *Professional Safety,* 48: 7, 14-20.

FIRE BRIGADES UNION 2004. *Off the Run: Recruitment and Retention of Retained Firefighters,* FBU.

FIRE BRIGADES UNION 2008a. *Fatal Accident Investigation-Summary Report Into the deaths of firefighters Ian Reid, John Averis, Ashley Stephens, and Darren Yates-Badley,* Fire Brigades Union.

FIRE BRIGADES UNION 2008b. *In the Line of Duty: Firefighter deaths in the UK since 1978,* Fire Brigades Union.

FIRE BRIGADES UNION 2008c. 'Inadequate training is compromising our safety'. *Firefighter*: November/December, 12-13.

FIRE BRIGADES UNION 2010. *Falling to the lowest common denominator: Rising to the challenge? How the Audit Commission got it wrong on the fire service,* Fire Brigades Union.

FIRE BRIGADES UNION 2013a. *Facing reality - the need for a fully funded fire and rescue service,* FBU.

FIRE BRIGADES UNION. Report of the Proceedings and Record of Decisions. 87th Conference, 15-16 May 2013 2013b. FBU, 1-170.

FLIN, R. 1996. *Sitting in the Hot Seat: Leaders and Teams for Critical Incident Management,* Chichester, Wiley & Sons.

FLIN, R. & ARBUTHNOT, K. 2002. *Incident Command: Tales from the Hot Seat,* Aldershot, Ashgate.

FLIN, R., MEARNS, K. & GORDON, R. 1998. Measuring safety climate on UK offshore oil and gas installations. *SPE international conference on health, safety and environment in oil and gas exploration and production.* Caracas, Venezuela.

FLIN, R., MEARNS, K., O'CONNOR, P. & BRYDEN, R. 2000. Measuring safety climate: identifying common features. *Safety Science,* 34 177-192.

FLIN, R., O'CONNOR, P. & CRICHTON, M. 2008. *Safety at the Sharp End: A Guide to Non-Technical Skills,* Farnham, UK, Ashgate.

FROST, P. J., MOORE, L., LOUIS, M. R., LUNDBERG, J. & MARTIN, J. (eds.) 1991. *Organizational culture,* Newbury Park, CA: Sage.

GABRIEL, R. A. 1985. *Military Incompetence: Why the American Military Doesn't Win,* New York, Hill and Wang.

GAGLIARDI, P. (ed.) 1990. *Symbols and artifacts: views of the corporate landscape,* New York: Walter de Gruyter.

GAGLIARDI, P. 1996. Exploring the aesthetic side of organisational life. *In:* CLEGG, S. R., HARDY, C. & NORD, W. R. (eds.) *Handbook of organisation studies.* 565-580, Thousand Oaks, CA: Sage.

GAGLIARDI, P. 1999. Exploring the SS takes side of organisational life. *In:* CLEGG, S. R. & HARDY, C. (eds.) *Studying organisation: theory and method.* 311-326, Thousand Oaks, CA: Sage.

GHERARDI, S. 1995. When will he say "Today the plates are soft?": The management of ambiguity and situated decision-making. *Studies in Cultures, Organisations and Societies,* One 9-27.

GIBBONS, A. M., VON THADEN, T. & WIEGMANN, D. A. 2005. *Development of a Commercial Aviation Safety Culture Survey for Maintenance Operations,* Aviation Research Lab Institute of Aviation.

GIGERENZER, G. 2014. *Risk Savvy: How to make good decisions,* London, Penguin Group.

GIGERENZER, G. & GOLDSTEIN, D. G. 1993. Reasoning the Fast and Frugal Way: \Models of Bounded Rationality. *Psychological Review,* 103: 4, 650-669.

GIGERENZER, G., HERTWIG, R. & PACHUR, T. (eds.) 2011. *Heuristics: The foundations of adaptive behavior,* Oxford University Press: Oxfoed.

GIGERENZER, G., TODD, P. M. & THE ABC GROUP 1999. *Simple heuristic that make us smart,* Cambridge, Cambridge University Press.

GLICK, W. H. 1985. Conceptualizing and measuring organizational and psychological climate: Pitfalls in multilevel research. *Academy of Management Review,* 10: 3, 601-616.

GOMM, R., HAMMERSLEY, M. & FOSTER, P. (eds.) 2000. *Case Study Methods: Key Issues, Key Texts,* London: Sage.

GORSUCH, R. L. 1974. *Factor Analysis,* Evanston, Ill., Northwestern University Press.

GOUGH, B. 2013. *Striking the right balance* [Online]. SHP Online. Available: http://www.shponline.co.uk/striking-the-right-balance/ [Accessed: 30 January 2015].

GREEN, W. 2008. Are Industry Specialists More Efficient and Effective in Performing Analytical Procedures? A multi-stage Analysis. *International Journal of Auditing,* 12 243-260.

GREGORY, K. L. 1983. Native-view Paradigms: Multiple Cultures and Culture Conflicts in Organisations. *Administrative Science Quarterly,* 28 359-376.

GULDENMUND, F. W. 2000. The nature of safety culture: a review of theory and research. *Safety Science,* 34 215-257.

GULDENMUND, F. W. 2007. The use of questionnaires in safety culture research - an evaluation. *Safety Science,* 45 723-743.

HALLETT, C., RT.HON. LADY JUSTICE. 2011. Coroner's Inquests into the London Bombings of 7 July 2005.

HAMBRICK, D. 2001. Putting the Team into Top Management. *In:* PICKFORD, J. (ed.) *Financial Times Mastering Management.* 2.0 ed: Financial Times Prentice Hall.

HAMMERSLEY, M. & GOMM, R. 2000. Case study and theory. *In:* GOMM, R., HAMMERSLEY, M. & FOSTER, P. (eds.) *Case Study Method.* London: Sage.

HARDING, E. & DUELL, M. 2012. *Elf 'n' safety bird brains! 25 firemen who scrambled to rescue a seagull from a 3ft-deep pond refused to wade in because of regulations - leaving it to Joe Public to save the bird.* [Online]. Mail Online Available: http://www.dailymail.co.uk/news/article-2128585/Group-25-firemen-called-rescue-seagull-3ft-deep-pond-elf-safety-says-risky.html [Accessed: 20 April 2014].

HARRÉ, R. & SECORD, P. F. 1972. *The Explanation of Social Behaviour,* Oxford, Blackwell.

HARRIS, J. J. & SEGAL, D. R. 1985. Observations from the Sinai: The boredom factor. *Armed Forces and Society,* 11 235-248.

HATCH, M. J. & SCHULTZ, M. (eds.) 2004. *Organizational identity: A reader,* Oxford, UK: Oxford University Press.

HATTON-COHEN, S. 2014. *Fire Decision Model.* Institution of Fire Engineers (Scotland), Strathclyde FRS Training Centre, Cambuslanf, 4/6/2014.

HEALTH AND SAFETY COMMISSION 1997. *Safety Climate Measurement Tool,* London, HSE.

HEALTH AND SAFETY EXECUTIVE 1984. *Training for Hazardous Occupations: A case study of the Fire Service,* London, HM Stationary Office.

HEALTH AND SAFETY EXECUTIVE 1991. *Successful health and safety management, HSG65,* Norwich, HSE.

HEALTH AND SAFETY EXECUTIVE 1997. *Successful health and safety management, HSG65, 2 ed.,* Norwich UK, HSE Books.

HEALTH AND SAFETY EXECUTIVE 1999. *Reducing error and influencing behaviour, HSG48, 2 ed.,* United Kingdom, Health and Safety Executive.

HEALTH AND SAFETY EXECUTIVE 2010a. *The Management of Health and Safety in the GB Fire and Rescue Service: Consolidated Report based on the 8 Inspections completed by HSE in 2009/10*.

HEALTH AND SAFETY EXECUTIVE. 2010b. *Striking the balance between operational and health and safety duties in the Fire and Rescue Service* [Online]. Health and Safety Executive. Available: http://www.hse.gov.uk/services/fire/duties.pdf [Accessed: 5 May 2010].

HEALTH AND SAFETY EXECUTIVE. 2013. *Managing for health and safety, HSG65* [Online]. HSE. Available: http://www.hseni.gov.uk/hsg65.pdf [Accessed: 16 January 2016].

HEALTH AND SAFETY EXECUTIVE. n.d.-a. *Heroism in the fire and rescue service* [Online]. Health and Safety Executive. Available: http://www.hse.gov.uk/services/fire/heroism.htm [Accessed: 5 May 2012].

HEALTH AND SAFETY EXECUTIVE, n.d.-b, *What is a hazard?* Available from: http://www.hse.gov.uk/risk/theory/alarpglance.htm [Accessed: 12 May 2015]

HEALTH AND SAFETY EXECUTIVE. n.d.-c. *Work-related death: Investigation* [Online]. Health and Safety Executive. Available: http://www.hse.gov.uk/enforce/enforcementguide/wrdeaths/investigation.htm [Accessed: 20 April 2015].

HEINRICH, H. W. 1980. *Industrial Accident Prevention,* New York, McGraw-Hill.

HELMREICH, R. L. 2000. On error management: lessons from aviation. *British Medical Journal,* 320 781-785.

HEMPEL, C. E. 1966. *Philosophy of Natural Science,* Engelwood Cliffs, NJ, Prentice-Hall.

HER MAJESTY'S FIRE SERVICE INSPECTORATE 1999a. *Equality and Fairness in the Fire Service: Founding a Cultural Equality,* HMFSI.

HER MAJESTY'S FIRE SERVICE INSPECTORATE 1999b. *Fire Service Manual, Vol.1, Fire Service Operations: Incident Command,* London, TSO.

HER MAJESTY'S FIRE SERVICE INSPECTORATE 2002. *Fire Service Manual, Vol.2, Fire Service Operations: Incident Command,* London, TSO.

HER MAJESTY'S FIRE SERVICE INSPECTORATE 2008. *Fire Service Manual, Vol.3, Fire Service Operations: Incident Command,* London, TSO.

Fire and Rescue Services Act 2004, London, The Stationary Office.

HM GOVERNMENT. 2015a. *Firefighter's Pension Scheme: briefing note* [Online]. Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/224506/Firefighters__pension_scheme_reforms_factsheet.pdf [Accessed: 2 March 2016].

HM GOVERNMENT. 2015b. *Frequently asked questions - Firefighter's pension reforms* [Online]. Available: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/267635/Firefighter_pensions_-_the_facts.pdf [Accessed: 2 March 2016].

HOFSTEDE, G., HOFSTEDE, G. J. & MINKOV, M. 2010. *Cultures and Organizations: software of the mind,* London, McGraw Hill.

HOLGATE, A. & CLANCY, D. 2009. Portal experiences: the impact of fire fighters' experiences of threat on risk perception and attitudes to personal safety. *The Australian Journal of Emergency Management,* 24: 3, 15-20.

HOLROYD, R. 1970. *Report of the Departmental Committee on the Fire Service,* Home Office and Scottish Home and Health Department.

HOME OFFICE 1998. *Dynamic management of risk at operational incidents: Health and Safety: a fire service guide,* London, The Stationary Office.

HOPKINS, A. 2006. What are we to make of safe behaviour programs? *Safety Science,* 44 583-597.

HOPKINS, A. 2008. *Failure to Learn: the BP Texas City Refinery disaster,* Sydney, CCH Australia Limited.

HOWITT, D. & CRAMER, D. 2000. *An Introduction to Statistics in Psychology: A Complete Guide for Students, 2 ed.,* London, Prentice Hall.

HUGHES, E. C. 1958. *Men and their work,* Glencoe, IL, Free Press.

HUNT, J. G. & PHILIPS, R. L. 1991. Leadership in battle and Garrison: a framework for understanding the differences and preparing for both. *In:* GAL, R. & MANGLESDORFF, A. D. (eds.) *Handbook of military psychology.* 411-429, Chichester: John Wiley.

IAEA 1986. *Summary Report on the Post-Accident Review Meeting on the Chernobyl Accident.*

INSTITUTE OF INTERNAL AUDITORS 2011. *Definition of Internal Auditing, Code of Ethics, International Standards for the Professional Practice of Internal Auditing*, IIA.

INSTITUTE OF INTERNATIONAL FINANCE 2009. *Risk Culture,* Institute of International Finance.

INSTITUTE OF RISK MANAGEMENT 2011. *Risk appetite and tolerance: Executive Summary,* London, Institute of Risk Management.

INSTITUTE OF RISK MANAGEMENT 2012. *Risk Culture: Resources for Practitioners,* London, Institute of Risk Management.

JACOBS, J. 1992. *Systems of survival: a dialogue on the moral foundations of commerce and politics,* New York, Vintage.

JAEGER, C., RENN, O., A ROSA, E. & WEBLER, T. 2001. *Risk, Uncertainty, and Rational Action,* London, Earthscan Publications Ltd.

JANIS, J. L. 1982. *Groupthink, 2 ed.*, Houghton Mifflin.

JANIS, J. L. & MANN, L. 1977. *Decision making: a psychological analysis of conflict, choice, and commitment,* New York, Free Press.

JOINT EMERGENCY SERVICES INTEROPERABILITY PROGRAMME. 2014. *Joint Decision Model* [Online]. JESIP. Available: http://www.jesip.org.uk/joint-decision-model [Accessed: 2 March 2016].

JONES, A. P. & JAMES, L. R. 1979. Psychological climate: dimensions and relationships of individual and aggregated work environment perceptions. *Organizational Behavior and Human Performance,* 23 201-250.

JORDAN, A. 2013. *Austin Fire Department Safety Culture.* US Fire Administration-FEMA.

JOUNG, W., HESKETH, B. & NEAL, A. 2006. Using "War Stories" to Train for Adaptive Performance: Is It Better to Learn from Error or Success? *Applied Psychology: an International Review,* 55: 2, 282-302.

KAPLAN, S. & KAPLAN, R. 1983. *Cognition and environment: Functioning in an uncertain world,* Ann Arbor, MI, Ulrich's.

KATZ, D. & KAHN, R. L. 1978. *The social psychology of organisations, 2 ed.,* New York, John Wiley.

KATZENBACH, J. R. & SMITH, D. S. 1993. *The Wisdom of Teams,* Boston, Harvard Business School Press.

KILMAN, R. H. 1981. Toward a unique/useful concept of values for interpersonal behaviour: A critical review of the literature on value. *Psychological Reports,* 48 939-959.

KINNEAR, P. R. & GRAY, C. D. 2000. *SPSS for Windows Made Simple: Release 10,* Hove UK, Psychology Press.

KLEIN, G. A. 1995. Naturalistic decision making: Individual and team training. Seminar presented at Offshore Management Centre, Robert Gordon University, Aberdeen.

KLEIN, G. A. 1998. *Sources of Power: How People Make Decisions,* Cambridge, Mass, MIT Press.

KLEIN, G. A. 2003. *Intuition at work: Why developing your gut instincts will make you better at what you do,* New York, Doubleday.

KLEIN, G. A. 2014. *Seeing What Others Don't: The Remarkable Ways We Gain Insights,* London, Nicholas Brealey.

KLINE, P. 2000. *Handbook of test construction,* London, Routledgr.

KNIGHT, K. 2013. *Facing the Future: Findings from the review of efficiencies and operations in fire and rescue authorities*.

LABOUR RESEARCH DEPARTMENT 2008. *In the line of duty: firefighter deaths in the UK since 1978,* Fire Brigades Union.

LAUBER, J. K. 1992. *Aircraft Accident Report: Continental Express Flight 2574 In-Flight Structural Breakup. NTSB/AAR-92-04,* National Transportation Safety Board.

LEEDY, P. D. & ORMROD, J. E. 2005. *Practical Research: Planning and Design, 8 ed.,* New Jersey, Pearson Merril Prentice Hall.

LESLIE, D. J. 2011. *Fatal Accident Inquiry into the Death of Allison Hume,* Sheriff for North Strathclyde.

LEVENSON, N. G. 2011. *Engineering a Safer World: Systems Thinking Applied to Safety,* Massachusetts, Massachusetts Institute of Technology.

LEVY, C., LAMARRE, E. & TWINING, J. 2010a. *Taking control of organisational risk culture*.

LEVY, C., LAMARRE, E. & TWINING, J. 2010b. *Taking control of organizational risk culture,* McKinsey & Company.

LINCOLN, Y. S. & GUBA, E. G. 1985. *Naturalistic Inquiry,* Thousand Oaks, CA, Sage.

LINDESMITH, A. R. 1968. *Addiction and Opiates,* Chicago, Aldine.

LOCAL GOVERNMENT ASSOCIATION 2014. *AnyFire: The future funding outlook for fire and rescue authorities*.

LOCAL GOVERNMENT ASSOCIATION. 2015. *Fire peer challenge* [Online]. Available: http://www.local.gov.uk/peer-challenges/-/journal_content/56/10180/3510552/ARTICLE [Accessed: 2 Mar 2016].

LONDON FIRE BRIGADE 1993a. *Health and Safety: A Strategy for Improvement,* London Fire and Civil Defence Authority.

LONDON FIRE BRIGADE 1993b. *Operational Training: A Strategy for Improvement,* London Fire and Civil Defence Authority.

LUBNAU, T. 2006. Situational Awareness: Avoiding "The Charge of the Light Brigade". *Fire Engineering,* March 139-145.

MACDUFF, A. G., RT.HON. JUSTICE. 2012. Warwickshire County Council: Judgement and sentencing remarks.

MALNICK, E. & JAMIESON, S. 2016. Anger over 'boomerang' payments to fire chiefs. *Daily Telegraph*, 29 March 2016, p.1.

MANCHESTER EVENING NEWS. 2004a. *Fire chief's fury over death quiz* [Online]. Manchester Evening News. Available: http://www.manchestereveningnews.co.uk/news/greater-manchester-news/fire-chiefs-fury-over-death-1126276 [Accessed: 20 April 2015].

MANCHESTER EVENING NEWS. 2004b. *Hero fireman 'in dark' over risks* [Online]. Manchester Evening News. Available: http://www.manchestereveningnews.co.uk/news/greater-manchester-news/hero-fireman-in-dark-over-1125922 [Accessed: 20 April 2015].

MARCH, J. G. & SIMON, H. 1958. *Organizations,* New York, NY, Wiley.

MARTIN, J. 1992. *Cultures in Organizations: Three Perspectives,* Oxford, Oxford University Press.

MARTIN, J. 2002. *Organizational Culture: Mapping the Terrain,* London, Sage.

MARTIN, J. & MEYERSON, D. 1998. Women and power: Conformity, resistance, and disorganised co-action. *In:* KRAMER, R. & NEALE, M. (eds.) *Power and influence in organisations.* 311-348, Thousand Oaks, CIA: Sage.

MCCRORIE, H. 1996. *London Fire and Civil Defence Authority: "Securing cultural change": Review of progress made and framework for action,* Alchemy Business Communication.

MEDEWAR, P. B. 1969. *Induction and Intuition in Scientific Thought,* London, Methuen.

MEYER, J. & ROWAN, B. 1977. Institutionalized organisations: formal structures as a myth and ceremony. *American Journal of sociology,* 83 340-363.

MEYERSON, D. & MARTIN, J. 1987. Cultural Change: An integration of three different views. *Journal of Management Studies,* 24: 6, 623-647.

MEYERSON, D., WEICK, K. E. & KRAMER, R. M. 1995. Swift trust. *In:* KRAMER, R. M. & TYLER, T. R. (eds.) *Trust in organisations.* 166-195, Thousand Oaks, CA: Sage.

MITCHELL, J. C. 1983. Case and situation analysis. *Socialogical Review,* 31: 2, 187-211.

MULLINS, L. J. 2005. *Management and Organisational Behaviour,* Harlow, Financial Times Prentice Hall.

NÆVESTAD, T.-O. 2009. Mapping Research on Culture and Safety in High-Risk Organizations: Arguments for a Sociotechnical Understanding of Safety Culture. *Journal of Contingencies and Crisis Management,* 7: 2, 126-136.

NATIONAL OPERATIONAL GUIDANCE PROGRAMME. n.d. *Incident Command* [Online]. CLG/ CFO/ LFB. Available: https://fireandrescue-public.sharepoint.com/Pages/Guidance-Catalogue.aspx?guidanceid=140 [Accessed: 16 January 2016].

OFFICE OF THE DEPUTY PRIME MINISTER 2004. Draft Fire and Rescue National Framework 2004/05. London: ODPM.

OKRAY, R. & LUBNAU, T. 2004. *Crew Resource Management for the Fire Service,* Tulsa, Penn Well.

OPPENHEIM, A. N. 1992. *Questionnaire Design, Interviewing and Attitude Measurement,* London, Pinter.

ORASANU, J. & CONNOLLY, T. 1993. The reinvention of decision-making. *In:* KLEIN, G. A., ORASANU, J., CALDERWOOD, R. & ZSAMBOK, C. E. (eds.) *Decision-making in action: Models and methods.* 3-20, Norwood, NJ: Ablex.

OTT, J. S. 1989. *The organisational culture perspective,* Pacific Grove, CA, Brooks/Cole.

PALLANT, J. 2001. *SPSS Survival Manual: A step by step guide to data analysis using SPSS,* Maidenhead, UK, Open University Press.

PENNINGS, J. M. & GOODMAN, P. S. 1979. Toward a Workable Framework. *In:* GOODMAN, P. S. & PENNINGS, J. M. (eds.) *New Perspectives on Organisational Effectiveness.* 146-84, San Francisco, CA: Jossey-Bass.

PENTON, A., RETNOLDS, J. & FISHER-MORRIS, M. 2013. *Fire-fighting - a risky business? (Summary),* Fire Protection Association.

PERROW, C. 1999. *Normal Accidents: Living with High Risk Technologies,* Princeton, NJ, Princeton University Press.

PESSEMIER, W. 2010. *Fire Service Operational Risk Management*.

PESSEMIER, W. L. & ENGLAND, R. E. 2010. Safety First: Developing a Safety Culture in the US Fire Service. *The Annual Meeting of the International Research Society for Public Management.* Berne, Switzerland.

PETTIGREW, A. M. 2000. *In:* ASHKANASY, N. M., WILDEROM, C. P. M. & PETERSON, M. F. (eds.) *Handbook of Organizational Culture & Climate.* London: Sage Publications.

PIDGEON, N. 1998. Safety culture: Key theoretical issues. *Work & Stress,* 12: 3, 202-216.

PLATT, J. 1976. *Realities of Social Research,* London, Chatto and Windus.

PLATT, J. 1988. What can Case Studies do? *Studies in Qualitative Methodology,* 1 1-23.

PONDY, L. R., FROST, P. J., MORGAN, G. & DANDRIDGE, T. C. (eds.) 1983. *Organizational symbolism,* Greenwich, CT: JAI.

POWER, M. 2007. *Organized Uncertainty: Designing a World of Risk Management,* Oxford, Oxford University Press.

RAFAELI, A. & PRATT, M. G. 1993. Tailored meanings: on the meaning and impact of organisational dress. *Academy of Management Review,* 18 32-55.

RAFAELI, A. & WORLINE, M. 2000. Symbols in Organisational Culture. *In:* ASHKANSAY, N. M., WILDEROM, C. P. M. & PETERSON, M. F. (eds.) *Handbook of organisational culture and climate.* 71-84, London: Sage.

RAKE, E. L. & NJÅ, O. 2009. Perceptions and performances of experienced incident commanders. *Journal of Risk Research,* 12: 5, 665-685.

RASMUSSEN, J. 1997. Risk Management in a Dynamic Society: A Modelling Problem. *Safety Science,* 27: 2/3, 183-213.

REASON, J. 1990. *Human Error,* Cambridge, Cambridge University Press.

REASON, J. 1997. *Managing the Risks of Organisational Accidents,* Farnham, Ashgate.

REASON, J. 2008. *The Human Contribution: Unsafe acts, accidents and heroic recoveries,* Farnham, Ashgate.

REICHERS, A. & SCHNEIDER, B. 1990. Climate and culture: an evolution of constructs. *In:* SCHNEIDER, B. (ed.) *Organisational climate and culture.* San Francisco: Jossey Bess.

ROBERTS, K. H. 1989. New Challenges in Organization Research: High Reliability Organizations. *Industrial Crisis Quarterly,* 3: 2, 111-125.

ROBSON, C. 2010. *Real World Research: A Resource for Social Scientists and Practitioner-Researchers,* Oxford, Blackwell.

ROCHE, D. n.d. Embedding a risk culture: role of senior management pivotal. *Risk Management* [Online]. Available: http://www.riskmagazine.com.au/article/embedding-a-risk-culture-role-of-senior-management-pivotal-119661.aspx [Accessed 14 March 2012].

ROJOT, J. 2008. Culture and Decision Making. *In:* HODGKINSON, M. & STARBUCK, W. H. (eds.) *The Oxford Handbook of Organizational Decision Making.* Oxford, UK: Oxford University Press.

ROKEACH, M. 1969. *Beliefs, attitudes and values: a theory of organisation and change,* San Francisco, Jossey-Bass.

RUST, J. & GOLOMBOK, S. 1999. *Modern Psychometrics: The Science of Psychological Assessment, 2 ed.,* London, Routledge.

SAFETY & HEALTH PRACTITIONER. 2011. *Fire chief sparks risk-aversion row* [Online]. Available: http://www.shponline.co.uk/fire-chief-sparks-risk-aversion-row/ [Accessed: 5 May 2012].

SAGAN, S. D. 1993. *The Limits of Safety: Organizations, Accidents, and Nuclear Weapons,* Princeton, Princeton University Press.

SCHEIN, E. H. 1985. *Organizational Culture and Leadership,* San Francisco, Jossey-Bass.

SCHEIN, E. H. 2010. *Organizational Culture and Leadership, 4 ed.,* San Francisco, Jossey-Bass.

SCHNEIDER, B. 1985. Organizational Behavior. *Annual Review Oof Psychology,* 36 573-611.

SCHNEIDER, B. (ed.) 1990. *Organisational climate and culture,* San Francisco: Jossey-Bass.

SCHNEIDER, B. 2000. The Psychological Life of Organizations. *In:* ASHKANASY, N. M., WILDEROM, C. P. M. & PETERSON, M. F. (eds.) *Handbook of Organizational Culture & Climate.* London: Sage.

SCHULTZ, M. 1995. *On studying organisational cultures: diagnosis and understanding,* Berlin, de Gruyter.

SCHWARTZ, S. H. 1996. Value priorities and behaviour: Applying a theory of integrated value systems. *In:* SELIGMAN, C., OLSEN, J. M. & ZANNA, M. P. (eds.) *The Ontario Symposium: Vol. 8. The psychology of values.* 1-24, Mahwah, NJ: Laurence Erlbaum.

Police and Fire Reform (Scotland) Act 2012 Edinburgh, Scottish Government.

SELIGMAN, C. & KATZ, A. N. 1996. The dynamics of value systems. *In:* SELIGMAN, C., OLSON, J. M. & ZANNA, M. P. (eds.) *The Ontario symposium: Vol. 8. The psychology of values.* 53-75, Mahwah, NJ: Lawrence Erlbaum.

SEPPÄNEN, H., MÄKELÄ, J., LUOKKALA, P. & VIRRANTAUS, K. 2013. Developing shared situational awareness for emergency management. *Safety Science,* 55 1-9.

SILVERMAN, D. (ed.) 1997. *Qualitative Research: Theory, Method and Practice,* London: Sage.

SILVERMAN, D. 2000. *Doing Qualitative Research: A Practical Handbook,* London, Sage.

SIMON, H. 1955. A behavioral model of rational choice. *The Quarterly Journal of Economics,* LXIX 99-118.

SIMON, H. 1956. Rational choice and the structure of environments. *Psychological Review,* 63 129-138.

SIR KEN KNIGHT. CHIEF FIRE AND RESCUE ADVISER. 2008. *Warwickshire Improvement Notice.* from SIR KEN KNIGHT. CHIEF FIRE AND RESCUE ADVISER to ALL CHIEF FIRE OFFICERS, 16 January 2008.

SKILLS FOR JUSTICE. n.d. *National Occupational Standards for Fire and Rescue Services-Career Pathways* [Online]. Skills for Justice. Available: http://www.skillsforjustice-cp.com/ [Accessed: 19 January 2016].

SLOVIC, P., FISCHOFF, B. & LICHTENSTEIN, S. 1980. Societal Risk Assessment: How Safe is Safe Enough? *In:* SCHWING, R. & ALBERS, W. A. (eds.) New York: Plenum.

SMIRCICH, L. 1983. Organisations as shared meanings. *In:* PONDY, L., FROST, P., MORGAN, G. & DANDRIDGE, T. (eds.) *Organisational symbolism.* 55-65, Greenwich, CT: JAI.

SMIRCICH, L. 1985. Is the concept of culture a paradigm for understanding organizations and oursleves? *In:* FROST, P., MOORE, L., LOUIS, M., LUNDBERG, C. & MARTIN, J. (eds.) *Organizational culture.* 55-72, Newbury Park, CA: Sage.

SMITH, M. J., COHEN, H. H. & CLEVELAND, R. J. 1978. Characteristics of successful safety programmes. *Journal of Safety Research,* 10 87-88.

SNOOK, S. A. 2000. *Friendly Fire: The Accidental Shootdown of U.S. Black Hawk over Northern Iraq,* Oxford, Princeton University Press.

SOETERS, J. L. 2000. Handbook of Organizational Culture and Climate. *In:* ASHKANSAY, N. M., WILDEROM, C. P. M. & PETERSON, M. F. (eds.) London: Sage.

SOMMER, B. & SOMMER, R. 1997. *A Practical Guide to Behavioral Research: Tools and Techniques, 4th ed.,* Oxford, Oxford University Press.

STACKMAN, R. W., PINDER, C. C. & CONNOR, P. E. 2000. Values Lost. *In:* ASHKANSAY, N. M., WILDEROM, C. P. M. & PETERSON, M. F. (eds.) *Handbook of Culture & Climate.* 37-54, London: Sage.

STAKE, R. E. 1978. The case-study method in social inquiry. *Educational Researcher,* 7 5-8.

STILES, K. T. 2009. *Fire Ground Size-Up for Loundoun County, Virginia,* National Fire Academy Executive Fire Officer Program.

STRANKS, J. 2007. *Human Factors and Behavioural Safety,* London, Butterworth Heinemann.

TALBOT, C. 2010. *Theories of performance: organizatioinal and service improvement in the public domain,* Oxford, Oxford University Press.

THE HEALTH FOUNDATION 2011. *Research scan: Does improving safety culture affect patient outcomes?,* The Health Foundation.

THOMPSON, A., III & BONO, B. 1993. Work without wages: The motivation for volunteer firefighters. *American Journal of Economics and Sociology,* 52 323-343.

TISSINGTON, P. & FLIN, R. 2005. Assessing risk in dynamic situations: lessons from fire service operations. *Risk Management,* 7 43-51.

TORRIE, S. 2012. *The 2008 Galston Mine Incident,* Her Majesty's Fire Service Inspectorate (Scotland).

TROPENAARS, F. & HAMPDEN-TURNER, C. 1999. *Riding the waves of culture, 2 ed.*, Nicholas Brealey.

TROUT, E. L. 1994. *Factors influencing the design of leadership skills courses for fire department company officers.* PhD, The University of Oklahoma.

TURNER, B. A. 1978. *Man-Made Disasters,* London, Wykeham.

TUSHMAN, M. L. 1977. A Political Approach to Organisations: a Review and Rationale. *Academy of Management Review,* 2 206-216.

VAN MAANEN, J. 1979. The self, the situation, and the rules of interpersonal relations. *In:* BENNIS, W., VAN MAANEN, J., SCHEIN, E. H. & STEELE, F. I. (eds.) *Essays in interpersonal dynamics.* 43-101, Homewood, IL: Dorsey Press.

VIRRANTAUS, K., MÄKELÄ, J. & DEMŠAR, U. 2009. Supporting the development of shared situational awareness for civilian crisis management with geographic information science - research plan. *In:* KREK, A., RUMOR, M., ZLATANOVA, S. & FENDEL, E. M. (eds.) *Urban and Regional Data Management.* 217-230, London: Taylor and Francis.

VON THADEN, T., KESSEL, J. & RUENGVISESH, D. Measuring Indicators of Safety Culture in a Major European Airline's Flight Operations Department. Measuring Indicators of Safety Culture in a Major European Airline's Flight Operations Department, 2008a Novotel Brighton Beach, Sydney. 1-8.

VON THADEN, T., SHARMA, G. & GIBBONS, A. M. 2008b. *Safety Culture Indicator Scale Measurement System (SCISMS),* Aviation Research Lab Institute of Aviation.

VON THADEN, T., WIEGMANN, D. A. & SHAPPELL, S. A. 2004. *Measuring Organizational Factors in Airline Safety,* University of Illinois.

WAGENAAR, W. A. & GROENEWEG, J. 1987. Accidents at sea: multiple causes an impossible consequences. *International Journal of Man-Machine Studies,* 27 587-598.

WARWICKSHIRE FIRE AND RESCUE SERVICE. 2012. *Warwickshire Fire and Rescue Service Press Conf* [Online]. Available: https://www.youtube.com/watch?v=yuayY_1cw0c [Accessed: 15 June 2012].

WATTERSON, A. 2013. *Firefighter fatalities at fires in the UK: 2004-13: Voices from the fireground,* University of Stirling.

WEICK, K. E. 1979. *The social psychology of organising,* Reading, MA, Addison-Wesley.

WEICK, K. E. 1985. A Stress Analysis of Future Battlefields. *In:* HUNT, J. G. & BLAIR, J. D. (eds.) *Leadership on the Future Battlefield.* Washington: Pergamon Brassey's.

WEICK, K. E. & SUTCLIFFE, K. M. 2001. *Managing the Unexpected: Resilient Performance in an Age of Uncertainty,* San Francisco, John Wiley & Sons.

WIEGMANN, D. A., VON THADEN, T. & GIBBONS, A. M. 2007. *A review of safety culture theory and its potential application to traffic safety,* AAA Foundation for Traffic Safety.

WIEGMANN, D. A., ZHANG, H., VON THADEN, T., SHARMA, G. & MITCHELL, A. 2002. *A Synthesis of Safety Culture and Safety Climate Research,* Aviation Research Lab Institute of Aviation.

WILLIAMS, A. S. n.d. *Safety Culture Within the Anne Arundel County Fire Department.* Masters, US National Fire Academy_FEMA.

WILLIAMS, C. A., JR., SMITH, M. L. & YOUNG, P. C. 1995. *Risk Management and Insurance, 7 ed.,* London, McGraw-Hill.

WILLIAMS, C. A., JR., SMITH, M. L. & YOUNG, P. C. 1998. *Risk Management and Insurance, 8 ed.,* London, McGraw-Hill.

WILSON, M. 2005. *Constructing Measures: An Item Response Modeling Approach,* London, Lawrence Erlbaum Associates Inc.

WOLFE, A., B 1924. 'Functional Economics'. *In:* TINGWELL, R. G. (ed.) *The Trend of Economics.* New York: Alfred A. Knopf.

WOODS, D. D., DEKKER, S., COOK, R., JOHANNESEN, L. & SARTER, N. 2010. *Behind Human Error, 2nd ed.,* Farnham, Ashgate.

WOOTEN, N. 2009. *Evaluating The Safety Culture of Hampton Division of Fire and Rescue.* US NAtional Fire Academy-FEMA.

YIN, R. K. 1994. *Case Study Research: Design and Methods, 2 ed.,* London, Sage.

YIN, R. K. 2003. *Case Study Research: Design and Methods, 3 ed.,* London, Sage.

YIN, R. K. 2011. *Applications of Case Study Research, 3 ed.,* London, Sage.

YIN, R. K. 2014. *Case Study Research: Design Methods, 5 ed.,* London, Sage.

YOUNG, D. I., LORD 2010. *Common Sense Common Safety: A report by Lord Young of Graffham to the Prime Minister following a Whitehall-wide review of the operation of health and safety laws and the growth of the compensation culture,* Her Majesty's Government, The Cabinet Office.

ZHANG, H., WIEGMANN, D. A., VON THADEN, T., SHARMA, G. & MITCHELL, A. Safety Culture: a Concept in Chaos? Proceedings of the 46th Annual Meeting of the Human Factors and Ergonomics Society, 2002.

Appendices

Appendix 2-1: An example list of various definitions of safety culture and safety climate to demonstrate the lack of consensus and consistency in how to define these concepts.

Reference	Definition of Safety Culture/Safety Climate	Choudhury et al (2007)	Guldenmund (2000)	Weigmann et al 2004	Perspective	
					Safety Culture	Safety Climate
Kennedy and Kirwan (1998)	An abstract concept, which is underpinned by the amalgamation of individual and group perception, thought processes, feelings and behaviours, which in turn gives rise to a particular way of doing things in the organisation. It is a sub-element of the overall organisational culture.	●			●	
Hale (2000)	Refers to 'the attitudes, beliefs and perceptions shared by natural groups as defining norms and values, which determine how they act and react in relation to risks and risk control systems'.	●			●	
Glendon and Stanton (2000)	Comprises attitudes, behaviours, norms and values, personal responsibilities as well as human resources features such as training and development.	●			●	
Guldenmund (2000)	Those aspects of the organisational culture which will impact on attitudes and behaviour related to increasing or decreasing risk.	●			●	
Cooper (2000)	Culture is 'the product of multiple goal-directed interactions between people (psychological), jobs (behavioural) and the organisation (situation)'; while safety culture is 'that observable degree of effort by which all organisational members direct their attention and actions toward improving safety on a daily basis'.	●			●	
Mohamed (2003)	A sub-facet of organisational culture, which affects workers' attitudes and behaviour in relation to an organisation's on-going safety performance.	●				●
Richter and Koch (2004)	Shared and learned meanings, experiences and interpretations of work and safety - expressed partially symbolically - which guide people's actions towards risk, accidents and prevention.	●			●	
Fang et al (2006)	A set of prevailing indicators beliefs and values that the organisation owns in safety.	●				●
Advisory Committee on the Sa	The safety culture of an organisation is the product of individual and group values, attitudes, perceptions, competencies, and patterns of behaviour that determine the commitment to, and the style of proficiency of an organisation's health and safety management.	●			●	
Zohar (1980)	A summary of molar perceptions that employees share about their work environments (safety climate)		●			●
Glennon (1982a, b)	Employees'perceptions of the many characteristics of their organisation that have a direct impact upon their behaviour to reduce or eliminate danger (safety climate) and, safety climate is a special kind of organisational climate		●			●
Brown and Holmes (1986)	A set of perceptions or beliefs held by an individual and/or group about a particular entity (safety climate)		●			●
Lutness (1987)	Not explicitly stated (safety climate)		●			●
Cox and Cox (1991)	Safety cultures reflect the attitudes, beliefs, perceptions, and values that employee share in relation to safety (safety culture)		●		●	
Dedobbeleer and Béland (1991	Molar perceptions people have of their work settings (safety climate)		●			●
International Safety Advisory C	Safety culture is that assembly of characteristics and attitudes in organisations and individuals which establishes that, as an overriding priority, nuclear plants safety issues receive the attention warranted by their significance (safety culture)		●		●	
Pidgeon (1991)	The set of beliefs, norms, attitudes, roles, and social and technical practices that are concerned with minimising exposure of employees, managers, customers and members of the public to conditions considered dangerous or injurious (safety culture)		●		●	
Ostrom et al (1993)	The concept that the organisation's beliefs and attitudes, manifested in actions, policies, procedures, affect its safety performance		●		●	
Safety Research Unit (1993)	Not explicitly stated		●			●
Cooper and Philips (1994)	Safety climate is concerned with the shared perceptions and beliefs that workers hold regarding safety in their workplace		●		●	
Geller (1994)	In a total safety culture (TSC), everyone feels responsible for safety and pursues it on a daily basis		●		●	
Niskanen (1994)	Safety climate refers to a set of attributes that can be perceived about particular work organisations and which may be induced by the policies and practices that those organisations impose upon their workers and supervisors		●			●
Coyle et al (1995)	The objective measurement of attitudes and perceptions toward occupational health and safety issues		●		●	
Barends (1996)	The collective mental programming towards safety of a group of organisation members		●		●	
Lee (1996)	The safety culture of an organisation is the product of individual and group values, attitudes, perceptions, competencies, and patterns of behaviour that determine the commitment to, and the style of proficiency of, and organisation's health and safety management		●		●	

Reference	Definition of Safety Culture/Safety Climate	Choudhury et al (2007)	Guldenmund (2000)	Weigmann et al 2004	Perspective	
					Safety Culture	Safety Climate
Cabrera et al (1997)	The shared perceptions of organisational members about their work environment and, more precisely, about their organisational safety policies		●			●
Williamson et al (1997)	Safety climate is a summary concept describing the safety ethic in an organisation or workplace which is reflected in employees'beliefs about safety		●			●
Carroll (1998) nuclear power in US	safety culture refers to a high value (priority) placed on worker safety and public (nuclear) safety by everyone in every group and at every level of the plant. It also refers to expectations that people will act to preserve and enhance safety, take personal responsibility for safety, and be rewarded consistently with these values.			●	●	
Ciavarelli & Figlock (199^) Naval aviation, US	safety culture is defined as the shared values, beliefs, assumptions, and norms that may cover an organisational decision-making, as well as individual group attitudes about safety.			●	●	
Cox and Cox (1991) industrial gases, European	safety culture reflects attitudes, beliefs, perceptions, and values that employees share in relation to safety.			●	●	
Cox & Flin (1998) theoretical Lee (1998) nuclear reprocessing, UK Wilpert (2000) theoretical in context of nuclear power	the safety culture of an organisation is the product of individual and group values, attitudes, perceptions, competencies, and patterns of behaviour that determine the commitment to, and the style and proficiency of, and organisations health and safety management.			●	●	
Eiff (1999) aviation, US	a safety culture exists within an organisation in which each individual employee, regardless of their position, assumes an active role in error prevention, and that role is supported by the organisation.			●	●	
Flin, Mearns, Gordon, & Fleming (1998) offshore oil and gas, UK	safety culture refers to entrenched attitudes and opinions that a group of people share with respect to safety. It is more stable (then safety climate) and resistant to change.			●	●	
Helmreich & Merritt (1998) aviation, US	safety culture: a group of individuals guided in their behaviour by the joint belief in the importance of safety, and their shared understanding that every member willingly upholds group's safety normsand will support other members to that common end.			●	●	
McDonald & Ryan (1992) theoretical in context of road transportation Pidgeon (1991) theoretical Pidgeon & O'Leary(1994) theoretical in context of aviation	safety culture is defined as the set of beliefs, norms, attitudes, roles, and social and technical practices that are concerned with minimising exposure of employees, managers, customers, and members of the public to conditions considered dangerous or injurious.			●	●	
Mearns, Flin, Gordon, & Fleming (1998) offshore oil and gas, UK	safety culture is defined as the attitudes, values, norms, and beliefs that a particular group of people share with respect to risk and safety.			●	●	
Meshkati (1997) transportation industry, US	safety culture is defined as that assembly of characteristics and attitudes in organisations and individuals that establishes that, as an overriding priority, nuclear plants safety issues receive the attention warranted by their significance.			●	●	
Minerals Council of Australia (1999) mineral industry, Australia	safety culture refers to the formal safety issues in the company dealing with perceptions of management, supervision, management systems, and perceptions of the organisation.			●	●	
Pidgeon (2001) theoretical in context of driver behaviour	a safety culture is in turn the set of assumptions and their associated practices that permit beliefs about danger and safety to be constructive.			●	●	
BASI (1996) civil aviation, Australia	the procedures and rules governing safetywithin an organisation are a reflection of its safety climate, which is centred around employees perceptions of the importance of safety and how it is maintained within the workplace.			●		●
Cheyne, Cox, Oliver, & Tomás (1998) Manufacturing UK & France	safety climate can be viewed as a temporal state measure of culture, which is reflected in the shared perceptions of the organisation at a discreet point in time.			●		●
Dedobbeleer & Beland (1991) construction, US	safety climate is viewed as an individual attribute, which is composed of two factors: management's commitment to safety workers' involvement in safety.			●		●
Flin, Mearns, Gordon, & Fleming (1998) offshore oil and gas, UK	safety climate refers to the perceived state of safety of a particular place at a particular time. It is therefore relatively unstable and subject to change depending on features of the operating environment.			●		●
Flin, Mearns, O'Connor, & Bryden (1998) review of various industries, only one aviation related study	safety climate is the surface features of the safety culture discerned from the workforce's attitudes and perceptions at a given point in time.			●		●

Reference	Definition of Safety Culture/Safety Climate	Choudhury et al (2007)	Guldenmund (2000)	Weigmann et al 2004	Perspective: Safety Culture	Perspective: Safety Climate
Griffin & Neal (2000) manufacturing and mining, Australia	safety climate should be conceptualised as a higher order factor comprised of more specific first-order factors. First-orderfactors of safety climate should reflect perceptions of safety-related policies, procedures, and rewards. The higher order factor of safety climate should reflect the extent to which employees believe that safety is valued within the organisation.			●		●
Hoffman & Stezer (1996) utilities, US	Safety climate is operationalized as perceptions regarding management's commitment to safety and work involvement in safety-related activities.			●		●
Mearns, Whitaker, Flin, Gordon, & O Connor (2000) offshore oil, UK	safety climate is defined as a "snapshot" of employees' perceptions of the current environment or prevailing conditions that impact on safety.			●		●
minerals Council of Australia (1990) minerals, Australia	safety climate refers to the more intangible issues in the company such as perceptions of safety systems, job factors, and individual factors.			●		●
Yule, Flin, & Murdy (2001) conventional power, UK	safety climate is defined as the product of employee perception and attitudes about the current state of safety initiatives at their place of work.			●		●
Zohar (1980)manufacturing, including metal, food, chemical and textile, Israel	safety climate is a particular type of organisational climate reflects employees'perceptions about the relative importance of safe conduct in the occupational behaviour. It can vary from highly positive to a neutral level, and its average level reflects the safety climate in a given company.			●		●
Zohar (2000) manufacturing, Israel	group level safety climate refers to shared perceptions among group members with regard to supervisory practices.			●		●

Appendix 4-1: The different roles to be found in the English Fire and Rescue Service

Role	Overview
Firefighter	Firefighters tackle a wide range of emergencies such as: • fires • road, round or air crashes • floods • incidents involving radioactive or other hazardous materials • bomb scares Increasingly, their work also involves preventing fires and other accidents. In addition there are routine duties, such as inspecting, cleaning and maintaining fire engines, training sessions and practice drills. **Retained Duty System (on-Call Firefighters)** While the majority of firefighters are full-time employees of the Fire and Rescue Service, an additional 30 per cent of our crews have jobs elsewhere and are 'on-call' with the local fire station.
Crew Manager	Crew managers support watch managers in the management and administration of a watch – a group of firefighters. They may lead a small team of firefighters carrying out a specific task will take charge of small-scale incidents. They contribute to the protection of people and communities by: • Supporting and delivering community safety programmes • supervising the maintenance and response of an emergency service • providing leadership and support at incidents
Watch Manager	Watch managers are in charge of a group of firefighters (the 'watch') who are on duty at the fire station at the same time. When they attend fires or other incidents, watch managers are usually in charge of a fire engine. They may take overall control during small incidents. They also carry out day-to-day firefighting and fire prevention work.

	Experienced watch managers may be in overall charge of a small fire station, particularly if it is staffed by retained firefighters. Watch managers may have specialist duties relating to areas such as training or fire safety. They can also be involved in the development of policy at a junior level.
Station Manager	Station managers are responsible for the management and administration of one or more fire stations. They lead a team of firefighters, crew managers and watch managers, taking responsibility for: • managing resources • staff development • working with outside organisations, for instance on safety education • improving their station's emergency service • providing information to senior management – for example, detailed reports on incidents. Station managers take charge at serious incidents, such as large fires or collisions involving several vehicles.
Group Manager	Group managers manage a group of fire stations or are responsible for specialist functions within fire and rescue services, such as training or fire safety. As senior officers, their work includes writing detailed reports of incidents and carrying out management and policy work. Group managers are responsible for: • improving the quality of the service • managing physical and financial resources • improving their personal performance, and the performance of their team • making sure the work environment is healthy, safe and productive • managing information and maintaining good communications • meeting the objectives of business plans. During major incidents such as large fires, floods or serious road traffic accidents they undertake management and leadership

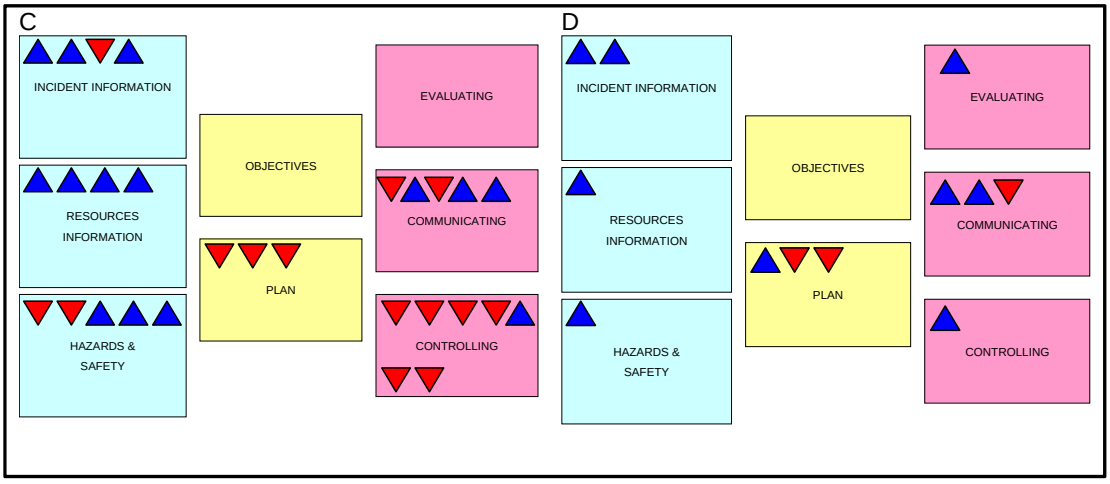
	roles.
Area Manager	Area managers are responsible for managing fire and rescue services across a large geographical area, offer leading a directorate within the service. They report to the brigade manager. They ensure that: • the activities of the brigade meet the requirements of the local community • progress is made towards achieving the aims of the corporate plan • necessary changes are identified and managed • resources are allocated to support activities and achieve corporate objectives • information is obtained and analysed, as a basis for making critical decisions • their personal performance, and the performance of their team, improves • the right people are identified and selected for key roles. Area managers provide leadership and support at events and incidents presenting a significant risk to the community.
Brigade Manager	Brigade Managers are the most senior managers in the fire and rescue service. The title 'Brigade Manager' covers three roles within fire and rescue services: • Chief Fire Officer – leads the service. • Deputy Chief Fire Officer – leads a directorate within the service and deputises for the chief fire officer • Assistant Chief Fire Officer – leads a directorate. In the case of serious large-scale incident, brigade managers represent the fire and rescue service in what is known as Gold Command, coordinating the overall response of all emergency services. At other times their role is to provide strategic leadership of the local fire and rescue service by: • creating a vision and setting an overall strategy for the service • identifying, securing and managing resources • reviewing the operating environment and the service delivered • creating a culture that supports and values people

	• monitoring the activities of the service • accessing information as a basis for key decisions.

Source: Skills for Justice (n.d.)

Appendix 4-2: Example of how one FRS used the DMM to assess promotion candidates on their incident command abilities for the Group Manager role.

Results of the operational assessment for two SO candidates applying for the role of GM.

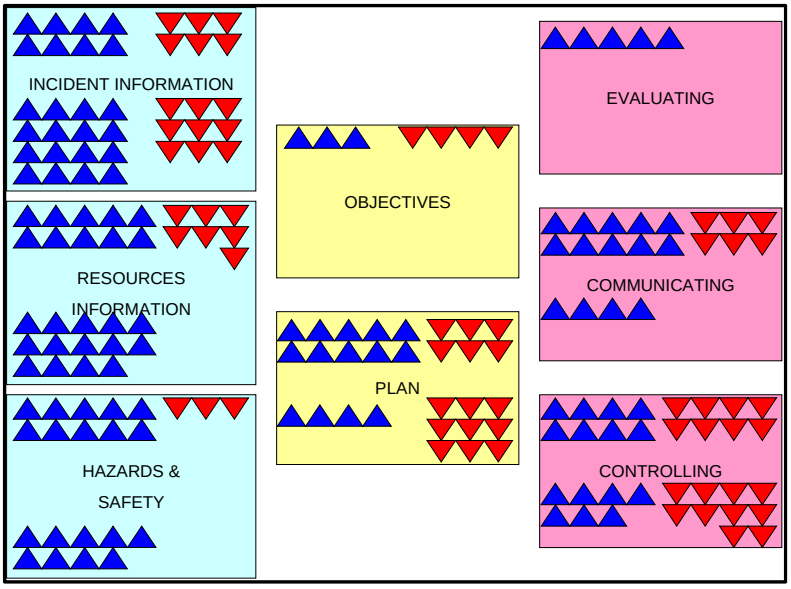


Source: The researcher's personal files.

The Figure above shows the results of the feedback for two actual candidates 'C' and 'D' from their operational assessment for the Group Manager role (this is a SO role). The blue upright triangles signify good points and the inverted red triangles signify learning points. Each candidate would receive feedback in the form of an MS PowerPoint presentation that was specific to that individual on their performance using the model as assessed by the two assessors. The MS PowerPoint presentation provided detailed information on why they had received their individual good or learning points so they could look to replicate the good points at future incidents and to act on or seek guidance as to how they might address their learning points. This form of feedback could also be used as formal documented evidence towards demonstrating their competence in operational command.

We can see in the following Figure that areas on the left, gathering the available information such as incident information; resources information; and hazards and safety, attract a lot of effort on the part of the candidate. Hazard and risk identification, and risk mitigation were relatively well conducted by the candidates. The three areas of concern are identifying and gathering the relevant information available at the incident, planning, and the controlling elements, which would be of particular concern in any subsequent analysis of general trends in applying the principles of incident command for officers at this level.

A summary of the results of all the SO candidates taking the GM's operational assessment.



Source: The researcher's personal files.

Appendix 5-1: Non-parametric tests of the four dimensions and the concept of safety culture

The Management dimension of Safety Culture

Comparison between the five fire and rescue services in regard to the Management dimension.

Using the Kruskal-Wallis non-parametric test for differences we find that X^2=123.590, df=4, Asymp.Sig.=0.001 indicating there is a significant difference between the mean rank scores of the groups. Table 0-1 shows the mean rank scores for each FRS with FRS 2 having a far higher mean rank at 522.55 with the next highest, that of FRS 4, with a mean rank of 430.78.

Table 0-1. Table of mean rank scores for the dimension and FRS variables.

Ranks

FRS		N	Mean Rank
Procedures dimension	1	83	424.57
	2	158	453.54
	3	142	271.13
	4	212	438.35
	5	202	394.42
	Total	797	

A series of Mann-Whitney U-tests were then used to evaluate the differences in the responses of the 7-point scale for the Management variable; the results are shown in Table 0.2 below. The results indicated that we could reject the null hypothesis of no difference between all FRSs, albeit there was no difference between FRSs 4 and 5. These results confirmed the findings of the parametric test using ANOVA.

Table 0-2. Results of the Mann-Whitney U-tests for the variable Management.

		2	3	4	5
1	*U*=	3346.500	4714.500	6440.000	6450.000
	z=	-6.302	-2.705	-3.713	-3.299
	Asymp.Sig.	0.000	0.007	0.000	0.001
	r=	-0.406	-0.180	-0.216	-0.194
	Sample size	241	227	296	288
2	*U*=		3957.000	12594.500	11415.000
	z=		-9.690	-3.998	-4.682
	Asymp.Sig.		0.000	0.000	0.000
	r=		-0.559	-0.208	-0.246
	Sample size		300	369	361
3	*U*=			8001.000	7938.500
	z=			-7.550	-7.231
	Asymp.Sig.			0.000	0.000
	r=			-0.401	-0.388
	Sample size			355	347
4	*U*=				20778.000
	z=				-0.690
	Asymp.Sig.				0.490
	r=				-0.034
	Sample size				416

Comparison between principal officers, senior officers and watch-based staff in regard to the Management dimension.

Using the Kruskal-Wallis non-parametric test we find that X^2=38.757, df=2, Asymp.Sig.=0.001 indicating there is a significant difference between the groups with mean ranks for WB=382.96 which was the lowest of the three groups with SO=540.76, or PO=678.46. A series of Mann-Whitney U-tests were then conducted and it was identified that we could reject the null hypothesis of no difference in the median scores between all the three groups of WB and SO: *U*=9052.500, *z*=-4.326, *p*=0.001, *r*=0.154: WB and PO: *U*=1239.500, *z*=-4.588, *p*=0.001, *r*=0.168: SO and PO: *U*=145.500, *z*=-2.454, *p*=0.014, *r*=0.334.

This confirms the results of the ANOVA test. The means and their 95% confidence interval are shown in Figure 5-5. We can see that the means and the 95% confidence intervals for WB, SO, and PO are very different with no overlap between any of the three groups. This suggests that all three groups are from different populations as was identified by both the ANOVA and Kruskal-Wallis tests.

The Procedures dimension of Safety Culture

Comparison between the five fire and rescue services in regard to the Procedures dimension.

Using the Kruskal-Wallis non-parametric test we find that X^2=60.089, df=4, Asymp.Sig.(2-tailed)=0.001 indicating there is a significant difference between the mean ranks of the groups. Mean ranks are shown in Table 0-3 from which we can see FRS 3 is considerably lower than for the remaining four FRSs.

Table 0-3. Table of mean rank scores for the variables Procedures and FRS_Numbers.

Ranks

	FRS	N	Mean Rank
Procedures dimension	1	83	424.57
	2	158	453.54
	3	142	271.13
	4	212	438.35
	5	202	394.42
	Total	797	

A series of Mann-Whitney U-tests was then conducted to identify between which FRSs there were these differences in median scores. The results are shown in Table 0-4. There were no significant differences between FRSs 1, 2, 4 and 5. However, FRSs 2 and 3 were significantly different to each other and the remaining three FRSs. This confirmed the results of the ANOVA test in that FRS 3 is in a subset of its own.

Table 0-4. Table of results for the Mann-Whitney U-tests for the variable Procedures and FRS_Numbers.

		2	3	4	5
1	*U*=	6134.000	3721.500	8561.000	7772.000
	z=	-0.824	-4.614	-0.360	-0.967
	Asymp.Sig.	0.410	0.000	0.719	0.333
	r=	-0.053	-0.308	-0.021	-0.057
	Sample size	241	225	295	285
2	*U*=		6191.500	15867.500	13671.000
	z=		-6.708	-0.867	-2.336
	Asymp.Sig.		0.000	0.386	0.019
	r=		-0.387	-0.045	-0.123
	Sample size		300	370	360
3	*U*=			8459.000	9976.000
	z=			-6.996	-4.812
	Asymp.Sig.			0.000	0.000
	r=			-0.372	-0.259
	Sample size			354	344
4	*U*=				8459.000
	z=				-6.996
	Asymp.Sig.				0.000
	r=				-0.372
	Sample size				354

Comparison between principal officers, senior officers and watch-based staff in regard to the Procedures dimension.

The results of the Kruskal-Wallis non-parametric test were X^2=39.072, df=2, Asymp.Sig.=0.001 indicating there is a significant difference between the groups with mean ranks for WB at 380.81 being considerably smaller than those for PO and SO at 664.21 and 551.06 respectively. A series of Mann-Whitney U-tests were then conducted and it was identified that we could reject the null hypothesis of no difference between the medians of the two groups of WB and PO (*U*=1235.5, *z*=-4.283, *p*=0.001, *r*=0.176), WB and SO (*U*=8533.5, *z*=-4.674, *p*=0.001, *r*=0.168), but not between SO and PO (*U*=172.00, *z*=-1.576, *p*=0.216). This confirmed the results of the ANOVA test.

The 95% confidence interval of the mean scores for the groups WB, SO and PO indicated that the means between SO and PO groups were similar although the PO confidence interval was greater than for the SO group. The confidence interval for the WB group was a lot tighter than for either SO or PO around a mean that was very much different to that of SO or PO. This can be seen graphically in Figure 5-9 within the main body of the text.

The Competence dimension of Safety Culture

Comparison between the five fire and rescue services in regard to the Competence dimension.

Using the Kruskal-Wallis non-parametric test the result was X^2=32.126, df=4, Asymp.Sig.=0.001 indicating there is a significant difference between the means of the five groups with FRS 2 having a mean rank of 468.34 and at the other end of the scale FRS 3 with a mean rank of 318.96. Table 0-5 shows the mean rank scores for all five FRSs.

Table 0-5. Table of mean rank scores for the variables Competence and FRS_Numbers.

Ranks

	FRS	N	Mean Rank
Competence dimension	1	86	408.45
	2	158	468.34
	3	145	318.96
	4	220	419.95
	5	207	413.39
	Total	816	

A series of Mann-Whitney tests between pairs of FRSs indicated that there were no significant differences in means between FRSs 3, 4, or 5. However, there were significant differences between FRSs 1 and 2, and the remaining FRSs. The results of the parametric and non-parametric tests are compared in Section 4.4.7.

Table 0-6. Table of results for the Mann-Whitney U-tests for the variable Competence and FRS_Numbers.

		2	3	4	5
1	*U*=	5740.000	4799.000	9182.000	8793.000
	z=	-2.017	-2.943	-0.402	-0.165
	Asymp.Sig.	0.044	0.003	0.687	0.869
	r=	-0.129	-0.194	-0.023	-0.010
	Sample size	244	231	306	293
2	*U*=		7194.500	15342.500	14249.500
	z=		-5.631	-1.959	-2.121
	Asymp.Sig.		0.000	0.050	0.034
	r=		-0.323	-0.101	-0.111
	Sample size		303	378	365
3	*U*=			12023.000	11647.500
	z=			-4.005	-3.596
	Asymp.Sig.			0.000	0.000
	r=			-0.210	-0.192
	Sample size			365	352
4	*U*=				22418.500
	z=				-0.278
	Asymp.Sig.				0.781
	r=				-0.013
	Sample size				427

Comparison between principal officers, senior officers and watch-based staff in regard to the Competence dimension.

Using the Kruskal-Wallis non-parametric test we find that X^2=6.935, df=2, Asymp.Sig.=0.001 from which we can determine that we should reject the null hypothesis that there is no difference between the mean ranks of the three groups. A series of Mann-Whitney U-tests was then conducted between the groups in pairs.

There was a statistically significant difference found between the PO group and the WB group (*U*=3297.00, *p*=0.041). No statistically significant results were found between the SO and WB groups (*U*=13298.00, p=0.085) and the SO and PO groups (*U*=299.00, *p*=0.378). The results of the parametric and non-parametric tests are compared in Section 4.4.7.

Work Pressure dimension of Safety Culture

Comparison between the five fire and rescue services in regard to the Work Pressure dimension.

Using the Kruskal-Wallis non-parametric test we find that X^2=74.206, df=4, Asymp.Sig.=0.0001. This significance value indicates there is a significant difference in the mean ranks of the five FRSs. A series of Mann-Whitney U-tests comparing median values was conducted and the results are shown in Table 0-7. This confirmed the findings of the ANOVA test.

Table 0-7. Table of results for the Mann-Whitney U-tests for the variable Work Pressure and FRS numbers.

		2	3	4	5
1	*U*=	3842.500	5721.500	6085.500	6203.000
	z=	-5.728	-1.106	-5.031	-4.222
	Asymp.Sig.	0.000	0.269	0.000	0.000
	r=	-0.366	-0.073	-0.287	-0.246
	Sample size	245	231	308	294
2	*U*=		7461.500	15945.000	14358.000
	z=		-5.179	-1.445	-2.004
	Asymp.Sig.		0.000	0.148	0.045
	r=		-0.298	-0.074	-0.105
	Sample size		302	379	365
3	*U*=			11551.000	11610.000
	z=			-4.441	-3.533
	Asymp.Sig.			0.000	0.000
	r=			-0.232	-0.189
	Sample size			365	351
4	*U*=				21909.500
	z=				-0.756
	Asymp.Sig.				0.450
	r=				-0.037
	Sample size				428

Those FRSs in red denote the combination of FRS, in pairs, in which the non-parametric tests found there were statistically significant differences. Those in green no such differences were identified.

Comparison between principal officers, senior officers and watch-based staff in regard to the Work Pressure dimension.

Using the Kruskal-Wallis non-parametric test we find that X^2=5.471, df=2, Asymp.Sig.=0.065 which indicates that at the p=0.05 level we should not reject the null hypothesis of no statistically significant differences between the mean ranks of the three groups. Therefore no further non-parametric tests using a series of Mann-Whitney tests were required. These results confirmed those of the parametric tests.

The concept of Safety Culture

Comparison between the five fire and rescue services in regard to their scores for the concept of Safety Culture.

The results from conducting the Kruskal-Wallis non-parametric test were X^2=127.912, df=4, p=0.001 which indicates that we can reject the null hypothesis of no difference in mean rank scores between the FRSs. A series of Mann-Whitney U-tests were then conducted in which it was found that FRSs 4 and 5 were the only pairing of FRSs in which there was no statistically significant difference. The results are shown in Table 0-8. This confirms the findings of the ANOVA and Tukey's post-hoc tests.

Table 0-8. Table of results of the individual Mann-Whitney U-tests for the variable Safety Culture and FRS_Numbers.

		2	3	4	5
1	*U*=	3185.500	4236.000	5166.500	5688.500
	z=	-5.949	-2.730	-4.593	-3.441
	Asymp.Sig.	0.000	0.006	0.000	0.001
	r=	-0.390	-0.185	-0.274	-0.208
	Sample size	233	217	281	275
2	*U*=		3725.000	12570.000	11426.500
	z=		-9.580	-3.102	-3.901
	Asymp.Sig.		0.000	0.000	0.000
	r=		-0.561	-0.164	-0.209
	Sample size		292	356	350
3	*U*=			6227.500	7195.000
	z=			-8.663	-7.283
	Asymp.Sig.			0.000	0.000
	r=			-0.470	-0.399
	Sample size			340	334
4	*U*=				18334.000
	z=				-1.274
	Asymp.Sig.				0.203
	r=				-0.064
	Sample size				398

Comparison between principal officers, senior officers and watch-based staff in regard to their scores for the concept of Safety Culture.

Using the Kruskal-Wallis non-parametric test we find that X^2=22.629, df=2, p=0.001 indicating there is a significant difference between the mean ranks of the three groups. A series of Mann-Whitney U-tests were conducted from which we were able to reject the null hypothesis of no differences in median scores between WB and SO (U=9574.00, p=0.001), WB and PO (U=1188.50, p=0.001), and between SO and PO groups (U=133.50, p=0.021). Both the ANOVA test and the non-parametric tests produced the same results between the three groups. The results of the Mann-Whitney tests are shown in Table 0-9.

Table 0-9. Summary of Mann-Whitney *U*-tests using the variables Safety Culture and PO_SO_WB.

		SO	PO
WB	*U*=	9574.000	1188.500
	z=	-3.449	-4.282
	Asymp.Sig.	0.001	0.000
	r=	-0.126	-0.160
	Sample size	748	720
SO	*U*=		133.500
	z=		-2.314
	Asymp.Sig.		0.021
	r=		-0.321
	Sample size		52

Appendix 6-1: Example of the DMM being used with the contents of an Incident Command Wallet.

The following pages show one example of the different types of sheets available for lower levels of incident command based on the Decision Making Model. The first sheet is regarding situational awareness providing details of the incident, resources available, and the hazards and safety associated with the incident.

The second sheet is related to the objectives and plan in which it shows a 'two-up, and two-down' typical of an older terraced property with a pumping appliance and two hoselines deployed, one to the ground floor and one to the first floor.

The third sheet is again the objectives and plan but this time for a road traffic collision.

The fourth sheet is the communicating and controlling sheet for a simple incident showing the communications links, which are also the controlling links, because if you do not have communications you do not have control.

The fifth sheet is again the communicating and controlling sheet but for a more complex incident being used by a sector commander (SC). The SC is in charge of a sector of the incident and has been delegated the responsibility for carrying out the incident commander's plan in that area.

INFORMATION

EAC: None

Incident No: 123456

Paint a Picture

CP:	Riv 1
Incident/Sector Commander	SubO Turner
Where:	28 Attercliffe Road
What is it:	Terraced House of 2F
Size:	10m. x 15m.
Situation:	10% roof alight, 2PR

What are you using:

Jets		BA	4		
HRJ	2	Foam			
135		Water Relay			
105					
Aerial					

* 1x Female, 1x Child reported seen on front 1st F: reported by Mrs Hudson.
* 1x Male removed to hosp, smk inhalation

RESOURCES

Sprinklers		Open Source	
Drenchers		Hydrants size	
Dry Risers		Nearest largest main	
Wet Risers			
Firefighting Lift			

HAZARDS & SAFETY

A (T) indicates there is an entry in the Tactical Information Folder

Safety Officer(s): 1

No Significant Risks identified: ✓

When making your analytical risk assessment consider WHO or WHAT might be at risk; WHEN (is there a time period applicable); WHERE (does it affect one or more areas of operation, or the wider environment).

	Actions to minimise Risk:
Structural Walls (T)	
Structural Roof (T)	
Structural Floors (T)	
Contents	
Processes	
Roadways	
Railways (T)	

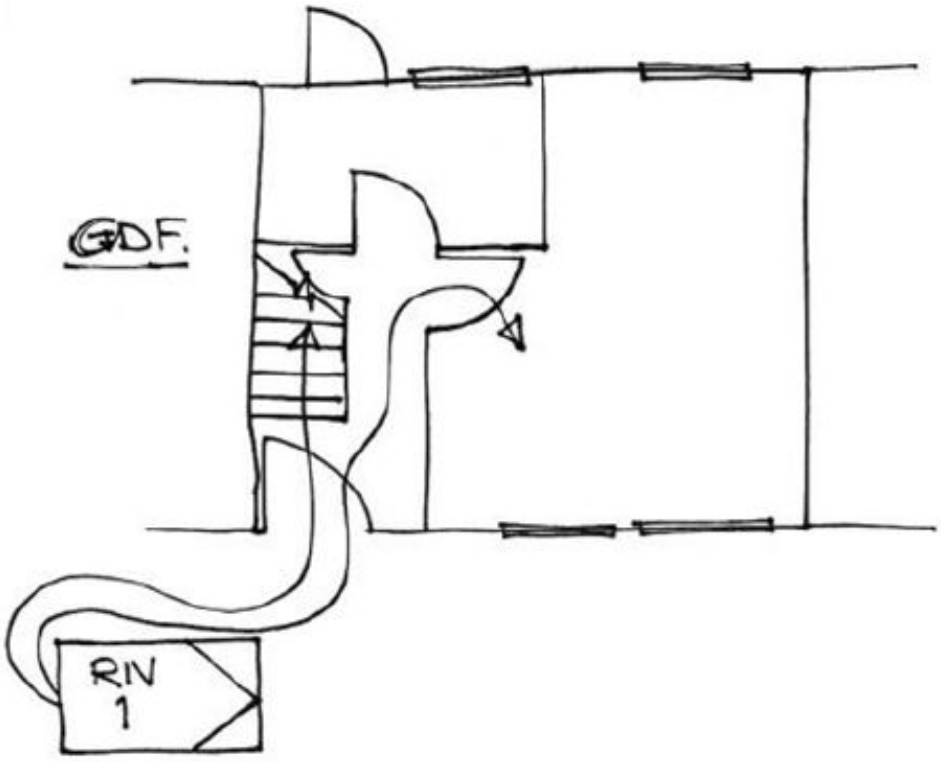
T (2) (f) card		Sheet replaced by (print name):	Time sheet replaced:

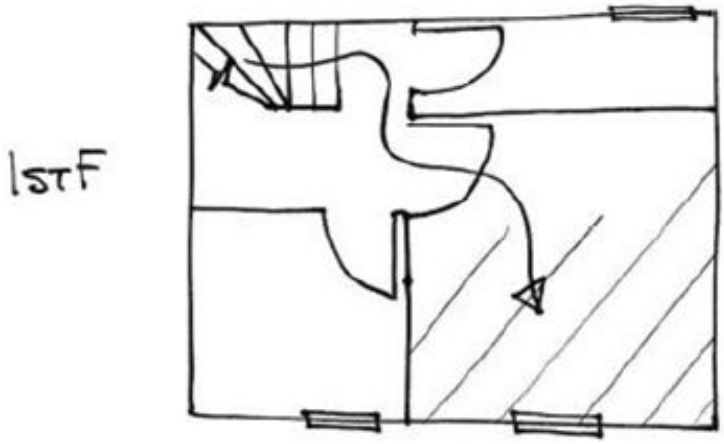
OBJECTIVES	SAVE LIFE	2	EXT FIRE	✓	HAZMATS		VENTILATI -O N		SALVAGE	

WATER DAMAGE	✓

Other specific objectives:

PLAN	Mode:	OFFENSIVE	✓	DEFENSIVE		TRANSITIONAL	





North

Wind direction

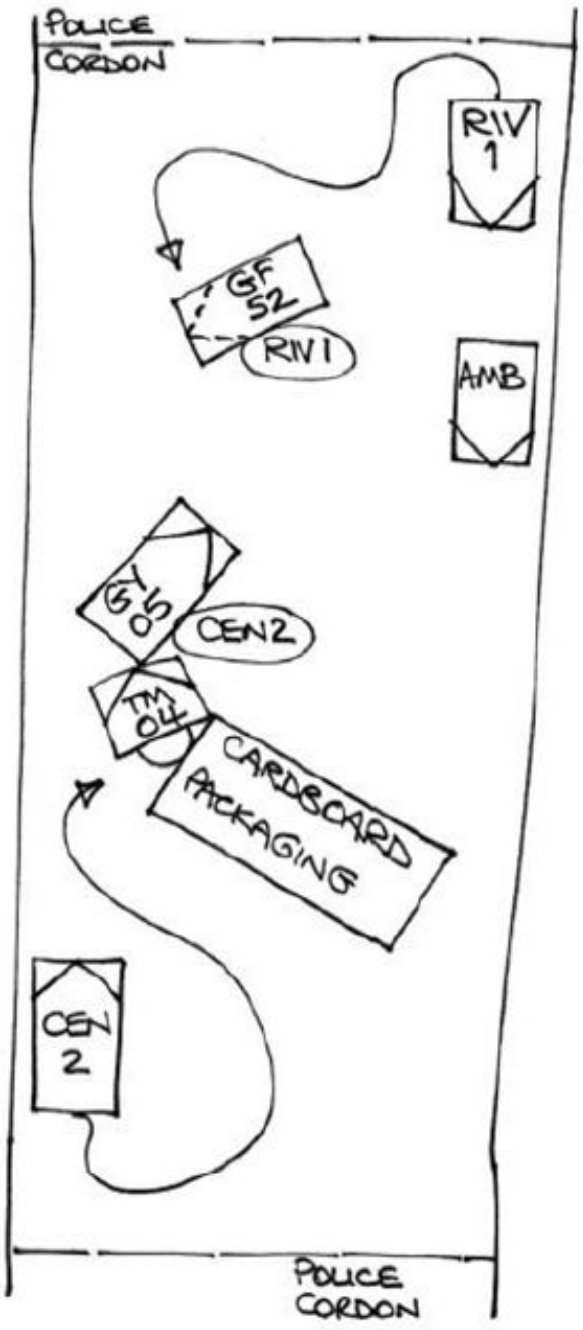
Sheet replaced by (print name):	Time sheet replaced:

OBJECTIVES	SAVE LIFE	1	EXT FIRE		HAZMATS		VENTILATI -ON		SALVAGE	

WATER DAMAGE	

Other specific objectives:

PLAN	Mode:	OFFENSIVE	✓	DEFENSIVE		TRANSITIONAL	



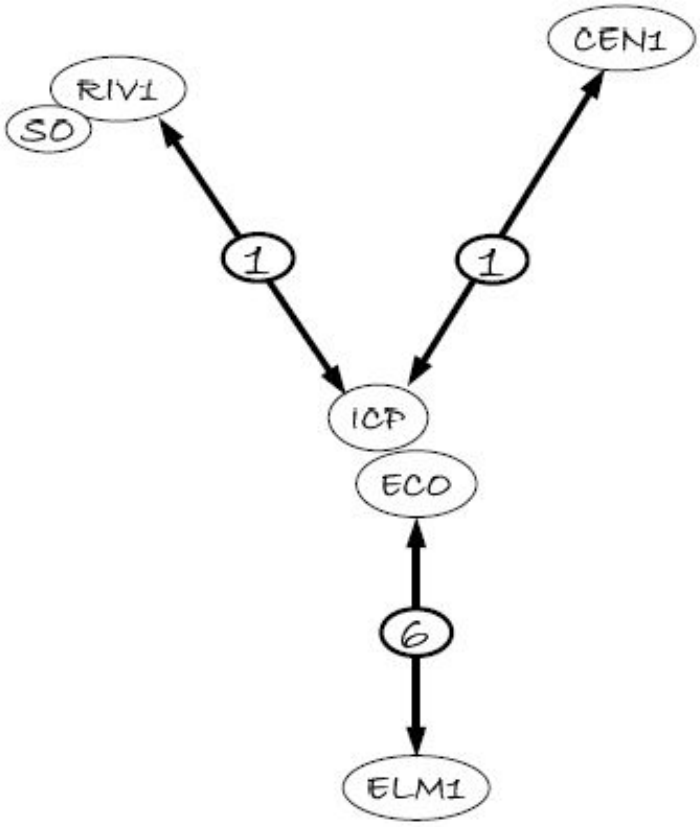
North

Wind Direction

Sheet replaced by (print name):	Time sheet replaced:

COMMUNICATIONS | Time of previous Messages sent

1205	1208	1214	1223				



In Attendance:

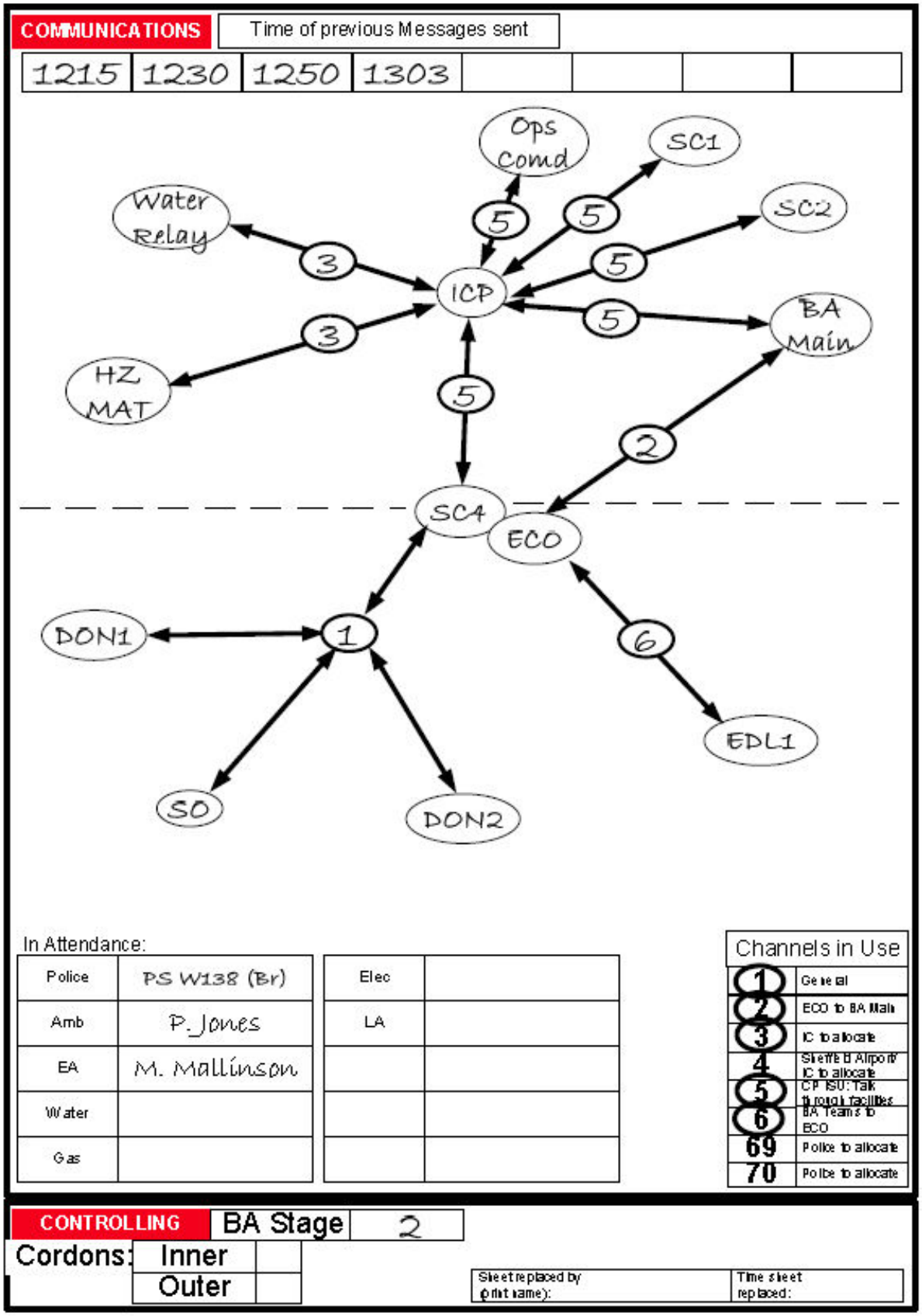
Police	W368	Elec	
Amb		LA	
EA			
Water	BETTS		
Gas			

Channels in Use	
1	General
2	ECO to BA Main
3	IC to allocate
4	Sheffield Airport IC to allocate
5	CP ISU: Talk through facilities
6	BA Teams to ECO
69	Police to allocate
70	Police to allocate

CONTROLLING | BA Stage | 1

Cordons: Inner | Outer

Sheet replaced by (print name):	Time sheet replaced:


COMMUNICATIONS
Time of previous Messages sent
1215
1230
1250
1303
Ops comd
SC1
SC2
Water Relay
ICP
BA Main
HZ MAT
SC4
ECO
DON1
1
6
EDL1
SO
DON2
5
3
2
In Attendance:
Police
PS W138 (Br)
Amb
P. Jones
EA
M. Mallinson
Water
Gas
Elec
LA
Channels in Use
1 General
2 ECO to BA Main
3 IC to allocate
4 Sheffield Airport IC to allocate
5 CP ISU: Talk through facilities
6 BA Teams to ECO
69 Police to allocate
70 Police to allocate
CONTROLLING
BA Stage
2
Cordons:
Inner
Outer
Sheet replaced by (print name):
Time sheet replaced:

Example – Incident Ground Analytical Risk Assessment (ARA)

Incident Number …….. Date & Time…….. Sheet of

Incident Type (GRA*) ……. Address / Location …….. Sector…..

Hazards	Who is at risk?	Existing Control measures	S 1-5	L 1-5	S x L	Risk Rating	Are existing control measures adequate?	If NO – Implement additional control measures needed to reduce risk
Ensure ARA is updated at regular intervals								Continue on separate sheet if required

INCIDENT COMMANDER	FORM COMPLETED BY	PREVIOUS TACTICAL MODE	
		CURRENT TACTICAL MODE	

Number	Incident Type – GRA*	Number	Incident Type – GRA*
	RESCUES		**TRANSPORT**
2.1	Ice/unstable ground	4.1	Road
2.2	Lifts and escalators	4.2	Rail
2.3	Sewers	4.3	Air
2.4	Silos	4.4	Marine
2.5	Trench/pits		**GENERIC HAZARDS**
2.6	Collapsed Structures	5.1	Electricity
2.7	Height	5.2	Acetylene
2.8	Flooding	5.3	Chemical
2.9	Animals	5.4	Biological
	FIGHTING FIRES	5.5	Confined Space
3.1	Buildings	5.6	Civil disturbance
3.2	High rises	5.7	Explosives
3.3	Chimneys	5.8	Flashover/Backdraught
3.4	Rural areas	5.9	Asbestos
3.5	Farms		
3.6	Using PPV		
3.7	Refuse		
3.8	Public entertainment		
3.9	Secure accommodation	GRA* Generic Risk Assessments found in a Guide to Ops. Risk *Assessment - Volume 3*	
3.10	Petro chemical installations		
3.11	Pipelines		

Notes / Plans / Actions

Has the risk to the environment been considered? Y/N

Record any actions and control measures overleaf.

Where Risks are high or very high inform IC/SC immediately

Severity Rating (S)

1. INSIGNIFICANT – No injury
2. MINOR – First aid only
3. MODERATE – Hospital treatment required
4. SIGNIFICANT – Permanent disability/ Fatality
5. CATASTROPHIC – Multiple fatalities / Large-scale hospitalisation of casualties

Likelihood Rating (L)

1. RARE – May occur in exceptional circumstances
2. UNLIKELY – Will seldom occur
3. POSSIBLE – May occur
4. PROBABLE – Will often occur
5. HIGHLY PROBABLE – Near certain

SEVERUTY (S)						
5	5	10	15	20	25
4	4	8	12	16	20
3	3	6	9	12	15
2	2	4	6	8	10
1	1	2	3	4	5
X	1	2	3	4	5

LIKELIHOOD (L)

RISK	1-3 TOLERABLE No further action- monitor	4-8 MODERATE Reasonably satisfactory- minor actions required	9-14 HIGH Unsatisfactory - Immediate action required	15-25 VERY HIGH Unacceptable- take immediate action

Appendix 6-2: Safety culture questionnaire.

A Safety Culture Questionnaire for use within the English Fire and Rescue Service.

Please complete the questionnaire as soon as you receive it and then post via the internal mail to: GEOFF WOOD, C/O

Introduction:
As part of my PhD research, I am seeking to gain a better understanding of safety culture in the English fire and rescue service; what this term means for the operational staff of those FRSs and for their key stakeholders; and how this relates to stakeholder expectations of the FRS. One of the aims of my research is to identify any disparities in expectations and how they might be resolved in light of some of the previous high-profile incidents at which the FRS has been criticised either for its actions, or lack of action.

With your help, and by completing this questionnaire, you will be assisting in creating a better understanding of safety culture in the FRS. Operational staff in three other FRSs assisted in identifying the key issues and in devising the questionnaire. Your participation by completing this questionnaire is entirely voluntary. This survey questionnaire is anonymous and the responses will not be used to identify individuals, your watch, station or your fire and rescue service. Completed questionnaires will be retained by me for eighteen months after which they will be destroyed.

Instructions: This questionnaire consists of a number of statements:

- For the first set of questions you are asked to indicate the extent to which you agree or disagree with each statement by circling the appropriate number. The remainder are tick box questions relating to age group, gender etc. are to enable comparisons to be made between groups of respondents.
- Move quickly between statements.

It will take approximately 25 minutes to answer all the questions:

Statement is....

1	2	3	4	5	6	7
Strongly disagree	Disagree	Slightly disagree	No opinion	Slightly agree	Agree	Strongly agree

1	Sometimes the need for a quick response at an incident means I don't have enough time to get the job done as required in operational procedures.	1	2	3	4	5	6	7
2	Operational procedure documents are so long and detailed it is difficult to remember each one of them on the incident ground.	1	2	3	4	5	6	7
3	Management acts decisively when a safety concern is raised.	1	2	3	4	5	6	7
4	I have sufficient time available to ensure my competence in applying operational procedures.	1	2	3	4	5	6	7
5	All officers and station-based personnel are made aware of the lessons learned from accidents to operational staff at incidents attended by my FRS.	1	2	3	4	5	6	7
6	Management is receptive to learning about safety concerns raised by operational staff.	1	2	3	4	5	6	7
7	Operational officers often fail to recognise when staff are acting unsafely on the incident ground.	1	2	3	4	5	6	7

Page 1

Safety Culture Questionnaire

		1 Strongly disagree	2 Disagree	3 Slightly disagree	4 No opinion	5 Slightly agree	6 Agree	7 Strongly agree
8	It would be best to remain anonymous when reporting an unsafe condition or near miss.	1	2	3	4	5	6	7
9	Having lots of safe working systems in place reduces the likelihood of an accident.	1	2	3	4	5	6	7
10	My fire and rescue service is active in seeking to reduce risks to firefighters on the incident ground.	1	2	3	4	5	6	7
11	I get no feedback as to whether I have been working safely or not.	1	2	3	4	5	6	7
12	I feel that I can influence how health and safety is implemented in my FRS.	1	2	3	4	5	6	7
13	Management emphasis is on preventing fires at the expense of maintaining operational competency.	1	2	3	4	5	6	7
14	It is difficult to find the time to practice all of the many operational procedures.	1	2	3	4	5	6	7
15	The promotion system produces managers, not leaders.	1	2	3	4	5	6	7
16	Learning opportunities are affected by individuals seeking to deflect blame on actions they were responsible for.	1	2	3	4	5	6	7
17	There are not enough resources, including time, for a FRS to train for every situation it might be called upon to attend.	1	2	3	4	5	6	7
18	I believe my FRS's operational policies and procedures are up-to-date.	1	2	3	4	5	6	7
19	Promoting operational safety is a high priority for management in my fire and rescue service.	1	2	3	4	5	6	7
20	If I raise health and safety issues with my line manager they will be dealt with.	1	2	3	4	5	6	7
21	Management is willing to invest time, money and effort to improve operational safety.	1	2	3	4	5	6	7
22	I believe that safety issues relating to firefighters on the incident ground are assigned a high priority within my FRS.	1	2	3	4	5	6	7
23	My FRS's health and safety reporting system enables me to report lapses in safety that take place on the incident ground without fear of retribution or of being ridiculed.	1	2	3	4	5	6	7
24	Time that used to be scheduled for operational training is now used on community safety initiatives.	1	2	3	4	5	6	7
25	Reporting accidents or near misses that occurred on the incident ground is a bureaucratic procedure taking more time than it's worth.	1	2	3	4	5	6	7

Safety Culture Questionnaire

		1 Strongly disagree	2 Disagree	3 Slightly disagree	4 No opinion	5 Slightly agree	6 Agree	7 Strongly agree
26	Senior officers are stopping firefighters from carrying out their job because of health and safety concerns.	1	2	3	4	5	6	7
27	When a firefighter or officer reports a safety problem, management acts quickly to correct safety issues.	1	2	3	4	5	6	7
28	Operational staff are encouraged to raise safety concerns whilst at an incident.	1	2	3	4	5	6	7
29	Accident investigations are mainly used to identify who is to blame.	1	2	3	4	5	6	7
30	The priority for my fire and rescue service is the safety of firefighters on the incident ground.	1	2	3	4	5	6	7
31	Sometimes it is necessary to depart from safe working practices and procedures at operational incidents.	1	2	3	4	5	6	7
32	There isn't time to look at operational procedure documents or their summaries when I am on the incident ground.	1	2	3	4	5	6	7
33	There is good communication in my FRS about safety issues which affect me.	1	2	3	4	5	6	7
34	The level of training is not sufficient to make up for the loss of experience from attending fewer incidents.	1	2	3	4	5	6	7
35	Operational procedures are just a way of covering manager's backs.	1	2	3	4	5	6	7
36	Firefighters and officers who admit their errors are making a career mistake.	1	2	3	4	5	6	7

Now please turn to the next page and complete the remaining questions.

Safety Culture Questionnaire

a) Have you attended a incident, or served at a station, at which a colleague has died or subsequently retired due to injuries sustained whilst attending an incident?

Yes ☐ No ☐

b) Which age group are you in?

Your age group	18-25	26-30	31-35	36-40	41-45	46-50	51-55	Over 55
	☐	☐	☐	☐	☐	☐	☐	☐

c) What is your length of operational service, both retained and wholetime if applicable, in the Fire and Rescue Service?

Your length of service	Less than 2 yrs	2 - 5 yrs	5 - 10 yrs	11 - 15 yrs	16 - 20 yrs	21 - 25 yrs	26 - 30 yrs	Over 30 yrs
	☐	☐	☐	☐	☐	☐	☐	☐

d) What is your current employment with your FRS? Please add a cross to the appropriate boxes.

FRS employment:	Both wholetime and retained (On Call)	Retained (On Call)	Wholetime
	☐	☐	☐

e) Are you employed by more than one FRS?

Yes ☐ No ☐

f) What is your current role with the FRS that you consider to be your main employer?

Firefighter	Crew Manager	Watch Manager 'A'	Watch Manager 'B'	Station Manager	Group Manager	Area Manager	Brigade Manager
☐	☐	☐	☐	☐	☐	☐	☐

g) Is your current position a temporary or substantive role?

Temporary ☐ Substantive ☐

Safety Culture Questionnaire

h) In what function are you currently employed within your 'parent' FRS?

Operations	Community Fire Safety	Legislative Fire Safety	Personnel & Training	Health & Safety	Other
☐	☐	☐	☐	☐	☐

i) In practical terms which **one** of the following functions do you consider yourself to be most experienced and skilled in?

Operations	Community Fire Safety	Legislative Fire Safety	Personnel & Training	Health & Safety	Other
☐	☐	☐	☐	☐	☐

j) Please complete the following by ticking the appropriate box:

Gender: Female ☐ Male ☐

k) Please complete the following by ticking the appropriate box:

Ethnicity:

White - British	☐	Asian or Asian British - Indian	☐
White - Irish	☐	Asian or Asian British - Pakistani	☐
White - Scottish	☐	Asian or Asian British - Bangladeshi	☐
Other White background	☐	Chinese	☐
Black or Black British - Caribbean	☐	Other Asian background	☐
Black or Black British - African	☐	Mixed background	☐
Other Black background	☐	Other Ethnic background	☐

Please use the blank page overleaf for any additional comments you would like to make in relation to your previous answers in this questionnaire.

If you have any questions, concerns, or would like to make any general comments in regard to my research, please feel free to contact me at: G.T.Wood@sms.ed.ac.uk

Thank you for having taken the time to complete this questionnaire as your participation is important and will contribute to creating a better understanding of the risk environment and the safety culture in which firefighters operate.

Safety Culture Questionnaire

Please add any comments you wish to make in the text box below.

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